ELECTRICAL REVIEW

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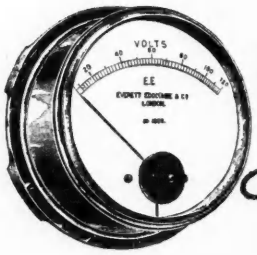

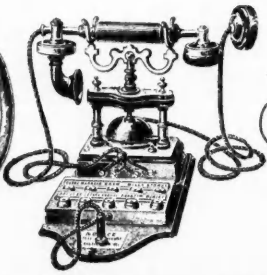

Then

Fifty years
1900 * of Service to the * 1950
Electrical Industry

.....and Now

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ELECTRICAL REVIEW

Vol. CXLVII No. 3805 27TH OCTOBER, 1950

THE OLDEST ELECTRICAL PAPER ● ESTABLISHED 1872

Changing Background

REVOLUTION IN SCIENTIFIC IDEAS

ENGINEERS, whose function it is to give material shape to scientific concepts, find cause for concern in the doubts thrown in recent years on the validity of laws of physics which they have been brought up to accept without question. They are apt to find chaotic a background to their work in which space, time and motion are not absolute qualities and in which, for example, electrons behave sometimes as solid particles and sometimes as electromagnetic waves. Mechanical analogies, once regarded as sufficiently explanatory, have been shown to be invalid. Moreover, experimental verification of theories has been shown to have limits beyond which an understanding of fundamental principles seems possible only to a few minds through pure mathematics.

Historical Approach

Those present at the Association of Supervising Electrical Engineers' meeting last week were clearly grateful to their president, Mr. T. G. N. Haldane, for providing a clue through the labyrinth by means of an historical approach, which gave probably as clear a perspective to modern trends of thought as the state of present knowledge permits. This may profitably be considered in its wider aspects in relation to developments in astrophysics, discussed by us last week, with its hypothesis of continuous creation of matter.

Unsatisfying intellectually as the present uncertainty may be, it has at least destroyed the 19th century mechanistic view, which often resulted in cocksureness as to the ability of physical science to explain the myriad aspects of life that were outside its ken—an attitude that was surely as unscientific and as likely to hamper even material progress as that of people before the Renaissance who were content to accept the speculation of authorities verified only by superficial observation, e.g., that the sun and stars revolved round the earth.

The Broader View

There is and always has been the danger of unbalanced outlook of this kind unless a necessarily specialized knowledge is corrected by a broad general education continued throughout life. The importance of breadth of view was emphasized by Mr. Haldane, who suggested that progress of knowledge has depended far more on evolution of thought than on evolution of technique. The present revolution in scientific ideas may be no greater than that in the 17th century when the experimental method of arriving at reality replaced speculations by great thinkers.

Yet the practical value of pure thought

is said to have been illustrated by Ampère, for instance, as late as the beginning of the last century. Indeed it seems likely that the future may see a reconciliation between the two methods. Possibly our difficulties to-day may appear to posterity as no more than would be found by the mediaeval mind in grasping principles that were commonplace in the Victorian era.

Out of the wreck of the old ideas, it is comforting to know the second law of thermodynamics (that heat cannot be transferred from a cold to a hot body without work) and all its implications, which are of pre-eminent importance to engineers, still retains its force. Also with the large sizes of matter handled by engineers, the statistical probability of their conformity to understood, if obsolete, principles is great enough to allow these principles to be regarded as providing, so far, practical working hypotheses.

"PRODUCTIVITY"

The two study teams, representing most sections and grades of the B.E.A. and the Area Boards, which toured the United States just a year ago have collected in a single joint report a mass of hitherto scattered facts and figures, so making comparison of British with American practice that much easier. They soon found that what is commonly called "productivity" is an elusive thing, not readily definable in the supply section of our industry. In their search for means of betterment the teams found relatively few large, or outstanding things, but very many small things whose influence, individually, may not always be immediately, or even directly, apparent. There is consequently in this report (to which further reference is made on another page) something for every professional connoisseur and for those of more general taste, too, for which reason much of the specialized information has been put into a long series of appendices.

I.E.E. BY-LAWS

It is three years since the By-laws of the Institution of Electrical Engineers were last changed. The special general meeting convened in London last week to approve of further alterations, which it did unanimously without discussion, did not attract any larger attendance than on previous similar occasions. Twenty-three of the existing by-laws ranging from No. 8 to No. 94, but not consecutively, will thus be changed. Some re-arrangement has been made merely to accord with fresh phrasing elsewhere. Other modifications will give effect to the Institution's policy on education and training, clarify election and transfer requirements, enable the Council to remit or reduce entrance fees (which have been increased) in appropriate cases and permit the number of ordinary members of Council to be increased (in 1952) for better representation of different branches of the industry and easing the burden of Council work on individuals. By-law 94 has been re-worded to correct anachronisms and slightly extend the range of financial investments admissible, by consent of H.M. Privy Council, to the Institution.

ECONOMY IN USE

More attention has hitherto been paid to efficiency in the production of energy than in its use, yet as Sir Harold Hartley emphasized in his presidential address to the British Association (*Electrical Review*, 8th September) the two aspects are of equal importance. In choosing efficiency in use as a theme for his chairman's address, Mr. A. N. Irens provided, with several practical examples, an appropriate keynote to the activities of the I.E.E. Utilization Section for the present session, including the November conference on "Electricity as an aid to Productivity" (over which Mr. C. T. Melling will preside). The increasing need for economy in the application of the world's power resources makes essential the fullest investigation of the subject in all its diverse branches.

SPEED OF LIGHT

The announcement made three years ago from the Electricity Division of the National Physical Laboratory—received with scepticism at the time—that the normally accepted speed of light was inaccurate is now confirmed. The figure is 186,282 instead of 186,271, or a difference of 11 miles/sec, which is not great. The changes involved will not at present be very important; the most significant will be in astronomical computation and fundamental calculations in atomic theory, although the new value will be of more immediate practical utility to radar engineers. The discovery is an example of the extreme accuracy of measurement made possible with the aid of equipment of very skilled workmanship made in the Metrology Division of the laboratory.

Reversing A.C. Motors

Methods Applicable to Different Types

By "ROTOR"

THE current in each stator phase winding of a three-phase induction motor creates a pulsating magnetic field. The combined effect of the three pulsating fields in different parts of the machine is equivalent to a revolving magnetic field of constant strength equal to 1.5 times the peak strength of the pulsating field due to one phase of the windings. This field revolves round the stator at synchronous speed, inducing electromotive force and current in the closed rotor circuit. The reaction between the current-carrying rotor conductors and the revolving stator magnetic field creates the torque, which drags the rotor round in the direction of the revolving field.

In order to reverse the three-phase motor it is necessary to reverse the rotation of the revolving magnetic field. This is done by changing the sequence of the supply to the phases of the stator windings, i.e., by reversing two of the supply lines to the stator. It is unnecessary to alter the connections to the rotor circuit of a slip-ring induction motor when reversing; this applies equally to two-phase and single-phase machines.

The stator leads may be changed over at any convenient point such as the stator terminals, starter, isolator or distribution box. However, where a star-delta starter is used, there are six connections between the stator and starter so it is easiest to alter the connections at some point on the mains side of the starter. Where frequent reversal of a three-phase motor is required a double-pole two-way switch provides a convenient means of reversing the two leads. A three-pole two-way switch, connected as in Fig. 1, may be used to isolate the motor from the supply as well as to reverse it.

Three-phase commutator motors, of the rotor-fed or Schrage type, may be reversed also by changing over two of the supply leads to reverse the phase sequence, if the brushes are set in the neutral position. If the brushes are not symmetrical with the neutral point it may be necessary to give them a backward lead from neutral after reversal so as to obtain a high starting torque and power factor.

In the two-phase three-wire induction motor one end of each phase of the stator

Fig. 1

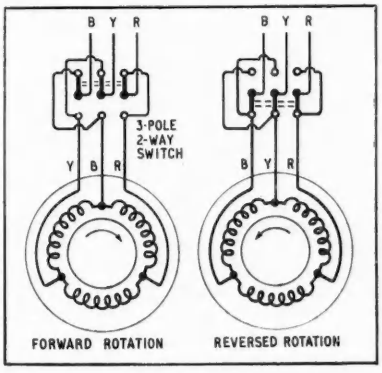
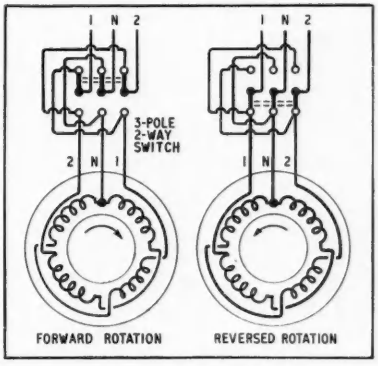


Fig. 2



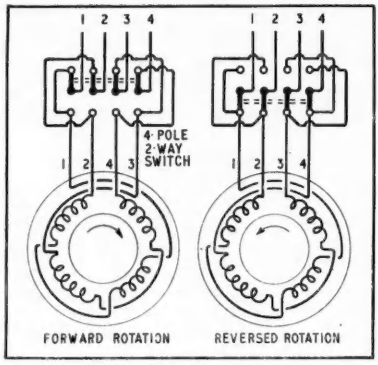
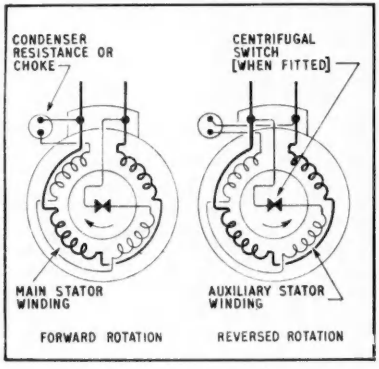


Fig. 3

windings is brought to a common or neutral terminal. Such a motor can be reversed by changing over the connections to the two outer or phase terminals, the neutral connection being unchanged. A double-pole two-way switch may be used for this purpose, or a three-pole two-way switch may be used for reversal and isolation as indicated in Fig. 2. In order to reverse the two-phase four-wire motor the connections to one phase of the stator windings need changing. A double-pole two-way switch can be used for this purpose, while a four-pole two-way switch will enable the motor to be isolated from the supply as well as reversed (Fig. 3).

The widest variety of motors is found in the single-phase field and it is necessary to identify the type of the motor before attempting to reverse it. There are various single-phase induction motors based on the split-phase principle, such as squirrel cage, slip ring, capacitor, capacitor-start, capacitor start-and-run, and shaded-pole motors. In the polyphase motors the physical spacing of the phases of the stator windings, and the time spacing of the peak voltages and currents applied to these windings, provide the conditions necessary for the creation of a revolving magnetic field. When the rotor of a single-phase induction motor is at rest the magnetic flux produced by the current in the main or running stator windings is pulsating and does not create a rotational torque. When the rotor is running, however, the magnetic effects of the currents which are induced in the closed rotor windings combine with the stator flux to create a resultant magnetic field which revolves round the stator at synchronous speed, although, unlike a polyphase motor, this field does not have a constant strength at all instants. It follows that when the main stator windings only are energized, the motor will not be self-starting but will run in whichever direction it is started.

Fig. 4



In order to make the single-phase induction motor self starting it is normally fitted with an auxiliary or starting winding on the stator to create a magnetic field midway between that of the main poles, this winding being supplied with current which is out-of-phase with that in the main stator windings. The phase displacement of the auxiliary winding current may be obtained by suitable proportioning of the number of turns and size of wire, or by connecting a resistance, choke, or capacitor in series with it. The auxiliary circuit is frequently short time rated and intended to carry current only during the brief starting period: this circuit must then be switched off by hand, or automatically by a centrifugal switch in the motor, when it has accelerated. All the split-phase motors mentioned above are reversed by changing the connections to the auxiliary circuit or the auxiliary windings (Fig. 4). Alternatively, they may be reversed by reversal of the current in the main windings alone. Where frequent reversal is required the connections may be changed by means of a double-pole two-way switch.

Capacitor Types

There are three main types of motors which employ capacitors for starting. These

are the capacitor-starting motor, the two-value capacitor motor, and the capacitor motor. The first is a simple split-phase motor in which the auxiliary windings and capacitor are in circuit only during starting. The two-value capacitor motor starts up with a high value of capacitance in series with the starting winding, the motor then continuing to run with the auxiliary windings energized through a lower value of capacitance. The plain capacitor motor has the auxiliary windings energized through a fixed-value capacitor all the time the motor is running. All three types can be reversed by the reversing of the current through either the auxiliary winding or the main winding.

Fig. 5 shows the connections of a type of capacitor motor which is particularly useful for reversing duty, since it may be started, stopped, or reversed by means of a single-pole two-way switch having an "off" position. If it is also necessary to isolate the motor from the supply, a double-pole switch may be used. This motor has two similar stator windings, one fed direct from the mains and the other from the mains through a capacitor. The switch reverses the motor by connecting the capacitor in series with the opposite winding.

Fig. 6 shows the "swing" connected capacitor-starting motor having two main stator windings and an auxiliary winding in circuit with a capacitor and centrifugal switch. For one direction of rotation the auxiliary circuit is fed from the mid point of the two main windings and one pole of the supply; for the opposite rotation the auxiliary winding is fed from the mid point and the other pole. The motor may thus be reversed, as shown, by means of a single-pole two-way switch, but a separate switch is required for stopping and starting. This type of connection is also employed in some plain capacitor motors.

Shaded-Pole Motors

The shaded-pole type of single-phase motor is often used to drive small apparatus such as a fan; it is not an efficient type of motor and is used only in fractional h.p. sizes. A section of each pole face is encircled by means of a copper band which acts as the short-circuited secondary winding of a transformer of which the stator coils are the primary. This band delays the cycle of magnetic flux in the encircled portion so that this reaches peak value later than does

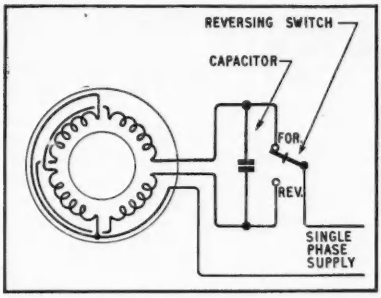
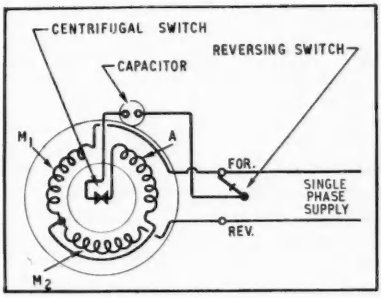


Fig. 5

the flux in the portion of the pole face which is not encircled. In this way the revolving magnetic field is created and the rotor always turns in the direction from the plain portion to the encircled portion of each pole. Thus, in order to reverse such a motor, the relative positions of the two portions of each pole face must be changed, and this cannot be done by simple switching if a single stator winding is used. It may be possible to reverse the motor by turning the whole stator core and its windings round in the end shields to obtain the conditions indicated in Fig. 7. In other cases it may be possible to reverse the complete stator and end shields with respect to the rotor and its bearings.

Special types of shaded-pole motors have been devised, however, to permit of reversal by switching. In Fig. 8a the motor has two separate stator windings M_1 and M_2 and a short-circuited winding X on the stator.

Fig. 6



One of the windings M_1 or M_2 is used, depending on the direction of rotation required; thus the motor can be started, stopped and reversed by means of a single-pole two-way switch having an "off" position. Fig. 8b shows the connections of a motor which has a single main winding M and two shading windings X_1 and X_2. The direction of rotation is determined by short-circuiting one or other of the shading windings. It will be noted that this motor requires a separate switch for starting and stopping. Fig. 8c shows the connections of a shaded-pole motor which has a single shading winding X and a main winding in four sections. The motor is started, stopped, reversed and isolated by means of a double-pole two-way switch with "off" position.

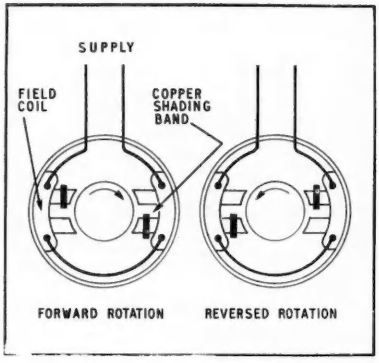
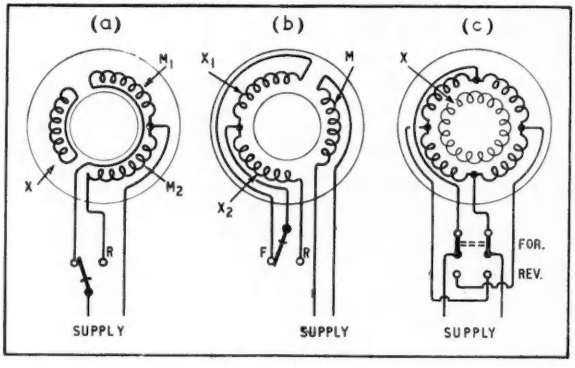


Fig. 7

Fig. 8



Repulsion Motors

We will now consider the repulsion types of single-phase motor. The plain repulsion motor has a stator winding which is fed from the supply and a wound armature with commutator. The brushes on the commutator are short-circuited together and often not insulated from the frame of the motor. This type of motor may be reversed by moving the whole set of brushes slightly round the commutator (Fig. 9). Usually, the frame of the motor is marked with the brush position for both directions of rotation. It is not necessary to alter any connections when reversing a simple repulsion motor of this type. Certain repulsion motors, however, are fitted with a compensating winding on the stator and when these are reversed by movement of the brushes the connections to the compensating winding should also be reversed.

Fig. 10 shows the "swing" connection which is used on one type of repulsion motor designed for reversing duty. This motor has an inducing winding I and two field windings F_1 and F_2. For one direction of rotation F_1 and I are connected in series to the supply: for the opposite rotation F_2 and I are connected in series. The brush position of this type of motor does not require moving when the motor is reversed. Another type of repulsion motor which can be reversed without brush movement (Fig. 11) has an inducing winding I in series with the field winding F, it being reversed by changing the connections to the field winding. A double-pole two-way switch with "off" position can thus be used to start, stop and reverse the motor, but not to isolate it from the mains.

Similar connections may be employed with repulsion-start induction motors or repulsion-induction motors. The repulsion-start induction motor is similar to the plain repulsion motor but the rotor has a centrifugal device which short-circuits the commutator when the motor has reached a certain critical speed at starting. The motor then operates as an induction motor with short-circuited

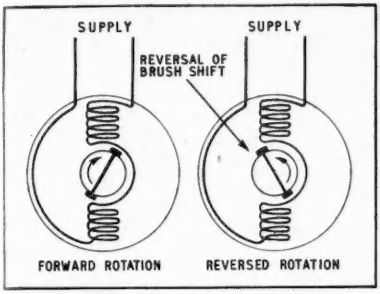


Fig. 9

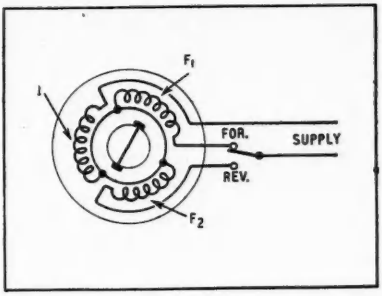


Fig. 10

rotor and has a small variation of speed on a varying load. In many cases the centrifugal device also raises the brushes from the commutator, after short-circuiting the commutator, so as to minimize wear of these parts. The repulsion-induction motor has a squirrel-cage winding on the rotor as well as the d.c.-type winding and commutator. These two types of motor may be reversed by brush movement, or the special types may be reversed by switching as in the case of the special repulsion motors referred to above. Mention may also be made of a repulsion motor with two sets of brushes which may function on the same or on different commutators. For one direction of rotation one set of brushes is short-circuited and the other is left open, reversal being then effected by opening the first set of brushes and short-circuiting the second set.

Some a.c. motors are suitable for plugging into reverse when running, thus applying a braking torque which brings the motor to rest and immediately accelerates it in the opposite direction. Polyphase induction motors may be used in this way, subject to certain precautions to be mentioned later. In the case of the split-phase starting motors, capacitor-start, two-value capacitor, and repulsion-start motors, the machines can only be reversed by switching after they have slowed down sufficiently to allow the centrifugal switch to close so that the starting connections are in operation.

The capacitor motor indicated in Fig. 5 and repulsion and repulsion-induction motors can be used on plugging duty. It should, however, be remembered that the motor will take a high current from the supply while reversing and there will be a considerable

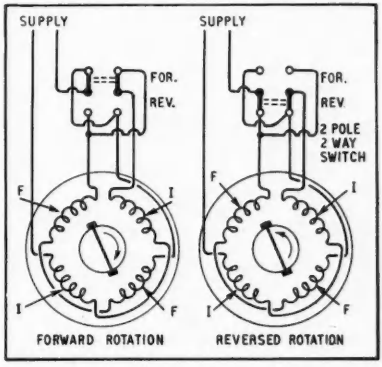


Fig. 11

stress on the shaft and its attachments, thus robust motors only should be used for plugging. The braking torque, braking current and mechanical stress can, of course, be reduced by connecting a resistance in series with the motor while decelerating and before accelerating in the other direction. Plugging is often used purely for braking a single-direction drive, in which case a relay is usually employed to switch off the current when the motor has come to rest and before it turns in the reverse direction.

Vertical Fluorescent Lamps

A LIGHTING system using vertical fluorescent lamps is being tried out in King Street, Aberdeen. The lamps, which are temporarily fixed to poles inserted in oil drums, give a floodlit effect. If the experiment is successful the lamps will be installed in Union Street next year.

VIEWS on the NEWS

By REFLECTOR

TRAVELLING in a Southern Region train the other day I noticed a tablet on the side of my compartment stating that the floor was electrically heated. This was the first time I had encountered this on the British Railways. A week or so earlier in a Swiss train early in the rather cool morning I pushed the regulator over to " Warm " and soon felt a glow in the region of my right leg from a grilled enclosure containing a heating panel. A minute later I thought my coat-sleeve was on fire but discovered that the arm-rest was also heated—to a rather uncomfortable degree. On the whole I think that the British system is better.

* * *

One strange outcome of the power cuts which unfortunately have already set in for the winter is the masking of clock dials in Sunderland. Complaints have been made by people going to work or catching buses and trams that they have been deceived by the stoppage of public electric clocks. To guard against this the Corporation is arranging that during the winter months every clock which comes within its jurisdiction shall be covered by wooden boards and " from the forlorn world its visage hide."

* * *

No one doubts that the National Coal Board is very conscious of its responsibilities in the shaping of a fuel policy for this country. The task is an immense one and multi-sided. Part of it concerns the production of more coal of better qualities, in which connection Viscount Hyndley announced at the Institute of Fuel dinner in London his expectation of the publication in mid-November of a national plan for the reorganization of the industry, spread over the next fifteen years. Another part of the overall task is minimization of the wasteful use of coal and, in the same speech, Lord Hyndley remarked that recently very serious thought had been given by the N.C.B., working closely with the B.E.A., to the generation of electricity at the pit-head. The case for and against such a policy has been argued often. It appears to have been revived now mainly because it might be the means of advantageously using the almost unmanageable and untransportable wet fines, generally called " slurries," which result from the preparation of coal to improve its quality.

* * *

Opinions of works managements vary on the question of smoking. Those who forbid it know very well that their rule is flouted by surreptitious methods which involve a waste of time. Others ban smoking on the ground of danger of fire but I was told by Mr. A. T. Winder, during a visit to the new Henley factory at Durham, that fire risk is actually decreased by permitting smoking in the works. It is rather strange that I saw few smokers in the works; it is possible that the absence of restrictions reduces the urge to smoke, such is the perversity of human nature.

* * *

Asked a few days ago to recommend a left handed thermostatically-controlled smoothing iron I had to confess that I could not think of one. Since then I have made several inquiries without avail and I am wondering whether such an appliance exists. There are, of course, many irons with thumb rests each side of the handle and cable entry at the back but none it seems with alternative positions for the now widely adopted and generally more convenient side entry of the cable. It would not, I should think, be difficult to design a moulding in such a way as to make it possible to keep the flexible cable at the side of the iron away from the user, no matter which hand is used.

* * *

The controversy about the B.E.A. power station posters continues. In their favour a correspondent to the *Manchester Guardian* claims that the B.E.A. has become a patron of artists and its posters enrich the " poor man's art gallery." He asks an opponent whether he would prefer " blank spaces, no printings, no artists and a slight cut in the price of electricity." It's a moot point.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE British Electricity Authority announces that **Mr. A. C. Thirtle,** A.M.Inst.C.E., A.M.I.E.E., M.Inst.F., chief generation engineer (operation), Eastern Division, has been appointed divisional controller of the Authority's South Western Division in succession to **Mr. J. T. H. Legge,** M.I.E.E., who is retiring. Mr. Thirtle received his early training at Norwich as a pupil of the late Mr. F. M. Long and held various posts with the Norwich Corporation before being appointed generation engineer. He was responsible for the commissioning and operation of the Thorpe power station. In 1939, Mr. Thirtle went to Swansea as deputy chief engineer and manager and was engaged on the modifications and extensions to the Tir John power station. He was appointed city electrical engineer and manager at Carlisle in 1944, and took up his appointment with the Eastern Division on Vesting Day. In 1943 he was chairman of the I.E.E. West Wales Sub-Centre.

Mr. Legge began his career with the B.T.H. Co. After a period with Midland Tramways, Ltd., he became chief engineer of the Shropshire, Worcestershire and Staffordshire Electric Power Co. in 1914, and chief engineer and general manager in 1925. Four years later he was appointed managing director of the company and also of the South Wales E.P. Co. For two years he was managing director of Edmundsons Electricity Corporation, Ltd., before joining the Central Electricity Board in 1935 as manager of the South West England and South Wales Area. From this position he became controller of the B.E.A. South Western Division.

Mr. A. Pollitt, M.I.Mech.E., M.I.Mar.E., A.M.I.E.E., chief generation engineer (construction), B.E.A. London Division, has been appointed deputy divisional controller of that Division. Mr. Pollitt was educated at the Salford Grammar School and the Royal Technical Institute, Salford, and served an apprenticeship with Browett, Lindley & Co., Ltd. He subsequently held appointments with Hick, Hargreaves & Co., Ltd., the British Westinghouse Manufacturing Co., Ltd., and the Brush Electrical Engineering Co., Ltd., and, in 1919, he was invited by the late Sir Leonard Pearce to join the Manchester Corporation Electricity Department where he was engaged on the development of the Barton power station. When, in 1926, Sir Leonard joined the London Power Co., Ltd., Mr. Pollitt accompanied him as assistant chief constructional engineer and, in 1932, succeeded to the post of chief constructional engineer, in which capacity he was largely responsible for the design, development and commissioning of the Deptford West and Battersea power stations. Mr. Pollitt is a freeman of the City of London as a liveryman of the Worshipful Company of Horners.

Mr. S. S. Scott, M.A., deputy chief labour relations officer of the B.E.A., has been appointed chief labour relations officer in succession to **Mr. A. H. Banks,** whose retirement has already been announced. Mr Scott joined the Northmet Power Co. in 1921 as personal assistant to the chief engineer and was afterwards appointed staff officer of the company. He was a member of the District Joint Industrial Council and the District Joint Board for the London area, also a member of the National Joint Industrial Council and National Joint Board. On the formation of the B.E.A. in 1947 Mr. Scott was appointed deputy director of establishments and became deputy labour relations officer in April last year.

The Minister of Fuel and Power has appointed **Col. Sir John Carew Pole,** D.S.O.,

Mr. A. C. Thirtle

Mr. J. T. H. Legge

Mr. A. Pollitt

Mr. S. S. Scott

D.L., J.P., of Torpoint, Cornwall, to be deputy chairman of the South Western Electricity Consultative Council in place of **Mr. H. C. I. Rogers,** of Bristol, who has resigned from the Council.

Mr. G. S. C. Lucas, O.B.E., has been co-opted to the Council of the Institution of Electrical Engineers to fill the vacancy created by the election of **Sir George H. Nelson** as a vice-president.

Mr. C. H. Stafford, general manager and engineer of Leicester City Transport since 1939, has resigned on medical advice. **Mr. A. E. Kitchen,** chief administrative officer, will act as deputy general manager until a successor has been appointed.

Mr. E. R. Howland, managing director and chief engineer for over 30 years of the British Pitometer Co., Ltd., has retired, and **Mr. J. Lennox,** A.M.I.Mech.E., has been appointed to succeed him. Mr. Howland's services have been retained in a consultative capacity.

Mr. J. R. Struthers, who retired from the position of manager of the No. 3 (Sheffield) Sub-Area of the Yorkshire Electricity Board at the end of March last year, has gone to Belfast where he has been appointed sole representative for the whole of Ireland of the Mitchell Engineering Group. Mr. Struthers was deputy city electrical engineer and manager at Belfast before going to Sheffield in 1935 as general manager and engineer of the Corporation Electricity Department.

Mr. O. E. Trivett, M.Brit.I.R.E., A.M.I.E.E., A.M.I.P.E., has been appointed personal assistant to the managing director of Aerialite, Ltd. Before taking up this appointment Mr. Trivett was largely responsible for the organization and setting up of a plastics extrusion and radio factory in India in conjunction with General Electric, Inc., of America.

W. T. Glover & Co., Ltd., announce the appointment of **Mr. H. Butcher,** Associate I.E.E., A.I.Mech.E., as power cable engineer in Scotland. Mr. Butcher recently returned to this country, after spending two years as contract engineer in charge of cabling of power stations in India for the company. At one time he was mains superintendent for the Sudan Light & Power Co., and later served as contracts engineer with Callender's Cable & Contruction Co., Ltd. After his war service Mr. Butcher was for a short time deputy district engineer for B.I.C. Cables Contract Department, at Stoke-on-Trent.

Mr. H. Butcher

Major E. H. W. Banner, T.D., M.Sc., M.I.E.E., F.Inst.P., A.M.I.Mech.E., has been elected a member of the Association of Consulting Engineers.

At the invitation of the Scottish members, the Council of the **Electrical Wholesalers' Federation** paid its autumnal visit to its Scottish Section, together with the E.L.M.A. and R.C.M.A. members who meet the Federation on joint negotiating committees. On this occasion the venue was the Marine Hotel,

At the E.W.F. Scottish meeting. Standing (left to right): Messrs. E. A. V. Peckham, G. W. Cartwright, H. Riley, A. B. Wildsmith (director), W. H. Swain, W. Crisp and C. Hall Marr. Seated: Messrs. A. Glenister, W. J. Bensley, J. M. Hollander (president), J. W. E. Rutherford and A. C. Baker

North Berwick, East Lothian. The programme followed the lines of previous years, one day being devoted to the Council meeting, with the Scottish members in attendance, the following day being set aside for golf competitions and social activities. In the evening the Scottish Section entertained its visitors to a dinner and dance.

Mr. J. Connell, B.Sc., F.R.I.C., manager of the Izal factory of Newton Chambers & Co., Ltd., has been elected chairman of the Institution of Works Managers in succession to **Mr. A. P. Young,** O.B.E., M.I.E.E., who has held that office for sixteen years.

Mr. H. W. Everitt, A.M.I.Mech.E., M.I.E.E., has resigned his wartime appointment as engineer with the Air Ministry Works Directorate at the R.A.F. station, Hawarden, and is retiring after fifty years in the electrical engineering profession. Mr. Everitt was the first engineer and manager of the Clacton U.D.C. Electricity Department from 1906 to 1919. Afterwards he was assistant works engineer at Johnson & Phillips, Ltd., Charlton. He served with the Royal Engineers Works Services from 1941 to 1944 as Engineering Officer and A.D.C.R.E. at Hereford. The staff at the R.A.F. station, Hawarden, has presented him with an inscribed barometer as a parting gift.

Mr. D. M. Thornton, B.Sc., A.M.I.E.E., engineer, Kirkcudbrightshire District, S.W. Scotland Electricity Board, has been appointed engineer to the Southern Sub-Area of the S.E. Scotland Electricity Board, and takes up his duties at Galashiels on 1st November.

Mr. W. E. Wheatley, sales director of H. J. Packer & Co., Ltd., and Charles Bond, Ltd., was elected chairman for the ensuing year of the Incorporated Sales Managers' Association, at the annual meeting held in London on 18th October.

The autumn meeting of the **Brush Golfing Society** was held on 14th October at Longcliffe Golf Club, near Loughborough, and a large contingent representing the Brush-A.B.O.E. group took part. In addition to the representatives of the Brush Golfing Society, competitors came from London headquarters; Mirrlees works, Stockport; McLaren works, Leeds; and Petter-Bryce works, Staines. There were fifty-nine entries for the P. C. Sharp cup, Mr. R. S. D. Bagnall (London) being the winner. Following lunch at the Priory Hotel, a bogey foursomes competition took place for silver tankards presented by Messrs. J. W. C. Milligan and E. J. Batchelor, the winners of which were Messrs. R. H. Tyers and R. W. Storey (both of Brush). A dinner was held at the Boot Hotel. Mr. H. E. Midgley (president) taking the chair. Speakers included Mr. P. C. Sharp, Mr. Midgley, Mr. J. H. R. Nixon, Mr. C. A. Hannah and Mr. J. W. C. Milligan.

An enjoyable evening was spent by all those who attended the silver jubilee dinner-dance of the **Electrical Trades' Commercial Travellers Association** on 6th October at the Café Royal, Regent Street, W.1, under the chairmanship of Mr. C. L. Elvy, and supported by Mr. N. V. Everton the president of the Association. Speeches were made by the president, Mr. E. J. Shuter, Mrs. Elvy, Mr. E. A. Boxall, Mr. W. Herbert and Mr. C. L. Elvy.

OBITUARY

Mr. R. B. Deeley, B.Sc., A.R.S.M., a director of Lightalloys, Ltd., died on 16th October, in his fiftieth year. Mr. Deeley joined the company in 1927 as works metallurgist and after a few years took up the further appointment of foundry superintendent. In 1948 he was appointed technical director. He represented the company on a number of important technical committees in the aluminium industry.

Mr. W. Price.—The death occurred on 16th September of Mr. W. Price, formerly in the service of the Bombay Electric Tramways & Supply Co., Ltd. Mr. Price commenced his electrical career with the Midland Electric Power Corporation in 1905. He served in the Forces from 1914 to 1919, and during that time was in the Dardanelles, Palestine and France. In 1922 he went to Bombay but retired owing to ill health in 1945. Since his return to this country he has been engaged with Chamberlain & Hookham, Ltd., Birmingham. While in India, Mr. Price was for a number of years secretary of the local section of the Institution of Electrical Engineers.

Mr. G. L. Pearson.—The death occurred on 13th October of Mr. George Lincoln Pearson, B.Sc., A.M.I.E.E., who, for the past twenty-one years, was on the staff of the Control Gear Engineering Department of the British Thomson-Houston Co., Ltd., at Rugby. Mr. Pearson was born in America and came to England in 1911. His technical training was received at Derby Technical College where he took his science degree prior to joining B.T.H. as an apprentice in 1923. He served in various Test Departments and the electrical laboratory until his appointment to the Control Gear Engineering Department in 1929. He was an active member of several societies, including the Radio Society of Great Britain.

Mr. J. J. Pridham.—The death has occurred at Gosforth (Northumberland) of Mr. James John Pridham who, before his retirement four years ago, was Admiralty electrical engineer and overseer on the Tyne for twenty years.

Colliery Generating Plant

Mixed-Pressure Installations

GENERATING plant which has been brought into operation at the Kingsbury Colliery in Warwickshire makes it self-supporting in respect of its power requirements for surface use and underground working.

The contracts for the generating plant, switchgear and auxiliaries were placed, prior to vesting date, with the General Electric Co., Ltd., by Kingsbury Collieries, Ltd., the scheme being handled by Mr. H. W. Hollands, who acted as consultant.

The power station is connected to the B.E.A. 3·3 kV network in a surface sub-station at the Dexter shaft. The switchgear is so arranged that the alternators can be paralleled with the B.E.A. supply or run independently as required. Alternatively, the sub-station at the Dexter shaft can be fed from the B.E.A. network and that at the Ryder shaft from the local supply. The plant now in commission comprises two mixed-pressure 1,250 kW turbo-alternators. The turbines run at 6,000 r.p.m. and are coupled through double-helical reduction gears to salient-pole alternators running at 1,500 r.p.m. The steam supply at the turbine stop valve is at 175lb sq in, 500 deg., and the low pressure supply from the winder exhaust is at 16lb/sq in absolute.

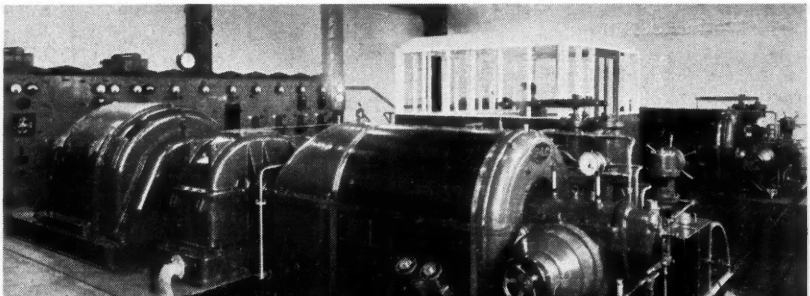
About 15,750lb/hr of low pressure steam is available from the winding engines during the colliery working shift, the high pressure steam being taken direct from the boilers. The proportions of high and low pressure steam admitted to the turbine are controlled automatically by means of the mixed pressure gear, which ensures that only the minimum quantity of high pressure steam is used to supplement the low pressure supply at any particular loading.

The Worthington-Simpson 2,100 sq ft surface condensers are of the divided-flow type, enabling one-half to be cleaned while the other half is in service.

The main switchboard in the turbine room is of the truck cubicle type consisting of twelve panels, and is equipped with manually operated oil circuit breakers of 25 MVA breaking capacity. Brown Boveri automatic regulators control the output voltage of the alternators to $\pm$ 0·75 per cent from no-load to full load and earth leakage protection is provided for both machines.

The electrical demands of the colliery at present can be met by a single turbo-alternator and the second set is used as a stand-by. A 3·5 kV overhead feeder to Birch Coppice Colliery is now in hand, and when this is complete both alternators will be needed to meet the additional load.

The two 1,250 kW 3.3 kV 1,500 r.p.m. turbo-alternators and main switchboard at Kingsbury Colliery



CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Motor Design Courses

I HAVE recently completed my H.N.C. in electrical engineering and, in all probability together with many others, am looking for a course which deals extensively with the subject in which I am particularly interested.

In my case the subject is f.h.p. motors, but there does not appear to be anything in this field at any technical college in the London area. Yet there must be at least a dozen firms in and around the London area dealing with their manufacture. There must be in these firms many young graduates who would welcome the opportunity to attend such a course.

Some technical colleges already run lecture courses given by designers employed by firms during the day and who are willing to pass on their knowledge to students in the evening. Would it not be possible to arrange a series of lectures on f.h.p. motors ?

Guildford. E. O. MULLER.

Wind Power

THE time lag between publication of your journal and its arrival in far Indonesia adds to the eagerness with which I read it. My knowledge of English is poor, but engineers have a more objective language —their international relationship and professional honour—so your readers will wish to know the views of others.

I was very much interested in your observations on wind power, although your opinion is not in line with mine. Undoubtedly to Western peoples the wind has represented a magic force; it was a source of power throughout the Middle Ages, since our ancestors circumnavigated the world in sailing ships. For a great epoch in Europe wind power was a loyal ally, but the steam engine and, subsequently, electric drive have supplanted it practically everywhere so that only in a few places has it been able to hold its own.

In wide and lonely areas in the United States and Russia and in mountainous places difficult of access in Switzerland it has proved a faithful help to many, yet in all these instances it has been a case of small units producing light. In the meantime there have always been engineers trying to utilize this source of world energy in a technically perfect manner by scientific working methods.

Doubtless fundamental considerations can lead to imposing results and mathematically it has been proven (Honnef) that in suitable areas alone on the earth wind power represents 80×10^9 kW utilizable, which for an annual period of use of 2,000 hours would be equivalent to a yearly production of 160×10^{12} kWh. By way of comparison it should be remembered that the water power reserves of the world are assessed at approximately 500×10^6 kW, of which 160 million kW is in the Congo area. Furthermore, various experts estimate that by the year 2,000 the yearly power load of the whole world will amount to 2×10^9 kW. We see from these figures that the water power capacity will be exceeded and that, therefore, new sources of power will have to be created, or found, at a later date. Wind power is thus indeed a mighty reserve of power.

Unfortunately, up to the present trials have always been conducted on a small scale—by individual "Bastler" ("radio fiddlers") of small financial means—whereas from the geophysical aspect only tests on a major scale can promise success at all. These two contradictory facts may be the reason why wind power plants have up to the present invariably failed. Wind power will have a future only providing it can be worked on a larger power station scale. The reason is that only above a certain altitude, upwards of 80 to 100 metres above ground level, can more or less constant wind strengths be relied upon, while in lower regions, in which the tests heretofore made have been conducted, gusts and squalls must invariably be experienced.

In accordance with these considerations wind power stations of approximately 300 metres height should be set up with a propeller, or turbine, system of approximately 150 metres diameter. According to detailed calculations, an output of 300 kW would result at a wind velocity of 4m/sec and at a

wind speed of 15m/sec it would be 17,000 kW; as at such heights an average velocity of 10 to 12 m/sec might be relied upon, appreciable power would be turned out. Now, if such power stations were connected up to a public network on a major scale, there would be a possibility of obtaining great uniformity, since different areas could balance one another, inclusive of integration with water power works and thermal stations. There would be a reliable compensation in large scale economy and it would lead to improved working conditions, although certainly much that is novel yet remains to be discovered.

In this geophysical understanding of the development of wind power practice, in combination with large scale integrated working, lie the great possibilities of this source of energy which is at present still lying fallow.

JEAN STIEGER, Dr. Ing.

Surabaya, Indonesia.

[This letter is a translation.—*Eds.*]

Progress of Research

D.S.I.R. Annual Report 1948-49

THE report for the year 1948–49 of the Department of Scientific and Industrial Research (D.S.I.R.) is now available from H.M. Stationery Office, price 5s 6d ($1.25 in U.S.A.), by post 5s 11d. It begins with the report of the Advisory Council which states the broad lines of policy along which the Lord President is being advised. It also contains information on researches in progress and completed at all the D.S.I.R. stations and by the research associations, this being the first time since the war that details of co-operative industrial research have been published collectively.

The Advisory Council points out two matters of special concern. So many problems of admitted importance are now brought to its notice that it is becoming difficult to ensure that an adequate effort is devoted to each one. It is essential, therefore, to be constantly on guard against undue dispersion of scientific effort. A study of the reports from D.S.I.R. stations shows how numerous are the problems already being investigated.

Last year attention was drawn to a lack of balance in the programmes of research and it was stated that not enough time and effort was being devoted to basic research. This warning is repeated and, while admitting the difficulties that are upsetting the balance, the Council calls bluntly for more basic research.

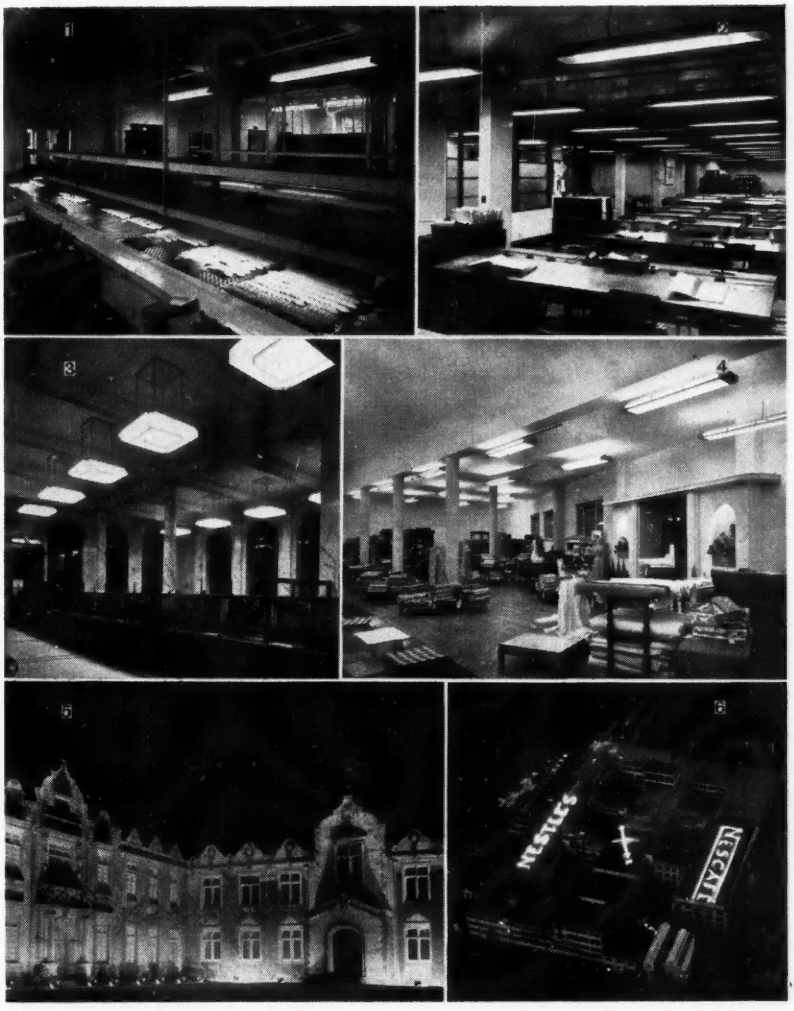
Another suggestion is that research associations might provide a more complete scientific service for their industries with research on everything bearing on production and even, perhaps, works organization. This service could include such economic and sociological studies as the councils of the research associations might determine. The report contains examples from research associations already working these lines. Development work is also discussed, but no general answer is attempted.

The use of research results by industry, a subject which has had considerable comment of late, is also considered. Some of the factors are set out and it is shown that the problem is many-sided and cannot be solved by one method. As the employment in industry of scientists and technologists spreads, much knowledge that at present has to be pushed into industry from outside will be pulled in from inside, with increased probability of effective use at an earlier stage.

The section called "Summary of Work" mentions researches in a great number of subjects ranging over almost the whole of industry. It is not possible in one book to explain the subjects fully, and detailed information can in most instances be obtained only from published technical information or direct from the station or research association concerned. The report may best be used as a reference book rather than an encyclopædia.

DIESEL ENGINE USERS

AT a general meeting of the Diesel Engine Users Association at Caxton Hall, London, last week Major-General A. E. Davidson (retired colonel commandant, R.E.) delivered his inaugural address as president and as has been the custom on these occasions he dwelt largely upon the experiences of his own lifetime. He dealt mainly with matters of history, and in particular of military history, presenting a most interesting review which undoubtedly filled a gap in the knowledge of the development and usage of oil engines where many members were concerned. He did not, however, make any attempt to re-open the controversial question of what exactly constituted a diesel engine.



A Variety of Modern Lighting Installations

(1) Fluorescent lighting at Peak Frean biscuit factory, London (Metropolitan-Vickers). (2) Office lighting, Anglo-American Oil Co., Bristol (Philips Electrical). (3) Installation at Chartered Bank of India, Australia and China, Bishopsgate (Thorn Electrical Industries). (4) Showroom lighting, Bonds (Norwich), Ltd. (G.E.C.). (5) Floodlighting, United College of St. Salvator, St. Andrew's (South East Scotland Electricity Board). (6) Neon roof sign, Hayes (Middlesex) factory of Nestlé Co., to attract attention of aircraft passengers (Claude-General Neon Lights, Ltd.)

Measuring Relative Humidity

Experiments with Sintered Ceramic Blocks

By A. GRAHAM THOMSON

TO guard against corrosion and loss of efficiency resulting from condensation, which in conditions of high humidity must eventually cause breakdowns, components used in tropical countries require to be permanently sealed in a dry atmosphere. It is difficult, however, to measure the humidity inside a sealed tin, and no entirely satisfactory instrument has so far been devised which is capable of covering a wide range of conditions of measurement.

This problem is being investigated at the Physics Laboratory of the British Scientific Instrument Research Association. The aim is to develop an automatic device with a detecting element of very small magnitude, which would be suitable for mounting permanently in a sealed chamber, such as a standard condenser, so that the internal humidity could be checked from time to time.

Adsorption and Resistance

The investigators are trying to solve the problem by means of small sintered blocks of ceramic. Ceramic powders can be formed into blocks of a suitable size and can be fired in such a way that their structure is highly porous. On such a body the amount of adsorbed water vapour varies enormously according to the relative humidity of the atmosphere to which the block is exposed. At present the investigators are obtaining an indication of the amount of adsorbed water vapour by measuring the electrical resistance of the block between opposite faces.

The dimensions of the blocks which are being used in the experiments are about 4 mm by 3 mm by 2 mm. Under normal atmospheric conditions in Britain the electrical resistance is very high, being of the order of hundreds of megohms. In an atmosphere where the relative humidity changes from 10 to 95 per cent, however, the resistance of such a brick might fall from 1,000 MΩ to 1 MΩ, responding rapidly to the changes. Given a suitable method for measuring high resistance, these bricks should provide a very sensitive means of detecting changes.

Errors in Readings

The investigations are not yet sufficiently far advanced to indicate whether a satisfactory method for measuring relative humidity is at last in sight. The properties of the bricks are at present being studied to determine how consistently bricks of a particular composition can be made to indicate humidity. Generally speaking, the readings obtained from any humidity-sensitive element are subject to various errors such as hysteresis, time-lag and drift.

These sources of error vary considerably from one type of element to another and are present in various degrees in the ceramic elements now being investigated. Hence it seems to be largely a matter of endeavouring to trace the causes of these aberrations, so that eventually the investigators can select a brick of the composition which gives the most consistent results. A survey of a large number of bricks of many different compositions is being undertaken in order to assess the advantages and disadvantages of the various types. Though the perfect element has not yet been found, the results so far obtained are encouraging.

One of the difficulties which had to be overcome was that of producing atmospheres of known humidity in which to test the bricks. The investigators have developed an apparatus which will enable their tests to be carried out with a reasonable degree of certainty.

At this stage of the investigation it seems evident that a suitable ceramic element could be used to indicate the humidity and changes of humidity in a small space such as the inside of a tobacco tin, but the degree of accuracy has yet to be determined.

If the research workers achieve their

object electrical and radio manufacturers will be able to insert tiny ceramic elements in each component, which should be capable of detecting faulty packing long before electrical failure or corrosion could develop, thus providing a safeguard against breakdowns due to the infiltration of damp atmospheres.

Many other industries would also benefit from an accurate means of measuring relative humidity, so that the scope for such instruments should be extremely great. They should also be suitable for applications where both humidity and temperature require to be controlled. At present the only simple method commercially available for controlling the humidity of an oven is by introducing a tray containing a solution which has a constant vapour pressure. Apart from the inconvenience of having to put trays of liquids into ovens, control of humidity by this method is difficult at temperatures above, say, 100 deg C. Control could be much more effectively achieved if small elements could be used to test the atmosphere continuously and operate a humidifying device.

Testing Earth Circuits

Supply Board's Recommendations for Ireland

By T. C. GILBERT, M.I.E.E.

IN "Electrical Accidents and Their Causes, 1948" (Factory Department, Ministry of Labour) the following note appears:—

> *Earthing.* This topic, with the kindred matters of double insulation, earth-leakage protection, earth-loop resistance measurement and earth continuity, is periodically the subject of lively debate at committee meetings, at evening discussions and of contributions to the technical Press. The Electrical Inspector may welcome the easy expression of rival opinions as a means of publicity, but the accidents which he investigates keep his feet to the solid earth of reality and this is the apology for returning to a subject dealt with almost yearly in these pages.

The too-easy acceptance of earthing circuits and systems without adequate check or test in this country never ceases to amaze me. Hope is raised with every new edition of the I.E.E. Regulations, only to be dashed; the twelfth edition is no exception in this respect. With the heavy loadings now becoming common to even domestic installations the earth circuit assumes ever-increasing importance but, so far as regulation requirements are concerned, it might rank with that of the front-door bell.

There are, of course, certain vague references to earth circuits, or earth continuity conductors, being of sufficiently low resistance and high current-carrying capacity to ensure the passage of fault current necessary to operate overload protective devices, but no test requirements are specified. It is interesting to compare the space devoted to the testing of insulation resistance in Section 11, 86 lines, with that for the impedance of the earth-continuity path, less than three lines; even the complicated test of an earth electrode is dealt with in 31 lines and this is, in my opinion, a completely inadequate test.

For one thing, the impedance of the earth circuit, on which the blowing of the consumer's fuses depends, is not contained only in the earth-continuity conductor of the installation and its earth electrode. There must still be taken into consideration the supply mains, the wiring and, in rural areas specially, the substation earth electrode. Any real check of the complete earthing circuit would have to take these further items into account, but there is no reference to this in Section 11, or in the specific requirements for earthing in Section 10. Further, this complete earth circuit must be adequate for, possibly, 150 A of earth fault current in even the smallest domestic installation equipped with a 60 A main fuse, but one looks in vain for any test requirement in order to ascertain this adequacy.

The recommendations of the Electricity Supply Board of Ireland make a good comparison, although for the time being they remain as recommendations only. Before becoming regulations they are widely circulated for comment and must then be tabled in both Houses of the Legislature. It may therefore be some time before they reach the regulation stage, assuming that all survive the circulation-for-comment stage.

First, their definition is:—

"The resistance of the earth fault circuit is the sum of the resistance of the complete circuit through which the earth leakage current of a consumer's installation flows, including the resistance of earth continuity conductor, earth lead, earth electrode, the earth itself, the supply authority's earth resistance and the impedance of the supply authority's main in the circuit, but excluding the resistance of the earth fault itself."

Secondly, regarding actual tests:—

"(A) *Direct Earthed Systems.* (i) Measure the resistance of the earth fault circuit (see above) and verify by calculation that a current of $2\frac{1}{2}$ times the current rating of each circuit fuse, or $1\frac{1}{2}$ times the instantaneous overload setting of each circuit breaker will flow at the declared voltage, or (ii) on circuits where the overload protection is 60 A, or less, a phase conductor may be momentarily connected to the exposed metal and the current switched on to the circuit. The protecting circuit breaker or fuse should open the circuit instantaneously. In this test, care should be taken that shocks are not received from the exposed metal due to possible defects in the earthing."

From these most realistic tests it would appear that the Irish engineers also have their feet solidly upon the ground on earthing matters, but after all they are only making sure that a protective circuit can carry out the function for which it was designed. Their test requirements go a little further, however:—

"(B) *Neutralizing.* (i) Similar to (A) (ii) above may be used, but it is more important to ascertain by inspection that the earthing system is in accordance with these regulations."

"(C) *Earth Leakage and Balanced Core.* To test the effectiveness of the protection afforded by earth-leakage and balanced-core circuit breakers, a resistance of not less than 25 ohms may be momentarily connected between the phase conductor of the circuit and the metal to be earthed. When the circuit breaker is closed it should operate instantaneously."

The Irish recommendations are really a model of what earthing requirements and tests should be. They consist, in the present draft form, of no fewer than 16 multigraphed foolscap pages with an additional three pages of diagrams. In my opinion there is not one superfluous word in this long document, in view of the importance of the matters described and discussed. There is an interesting classification of earthing areas with details of protective methods approved in some areas and prohibited in others. There is recognition that areas vary and application to the supply authority should result in a declaration as to the nature of any area, its classification and the protective methods that would receive approval for that area.

Heavy-Current Tests

The important section of the recommendations for the moment is that devoted to testing, however, and it is thought that the time has arrived when heavy-current testing of the *complete* earth fault circuit should be required in this country also. Home Office inspectors concerned with industrial installations press continually through the medium of annual reports for heavy-current tests and "loop" tests, but they do not seem to be considered necessary under the I.E.E. Regulations. Safety from fire and shock is not only dependent upon continuity and resistance of the earth continuity conductor, for instance, but also upon its ability to deal with heavy fault currents. It therefore seems only logical that regulations should describe suitable tests and require their application before the connection of any installation.

FRENCH POWER POSITION

OUR Paris Correspondent says that the present French power position is favourable. The hydraulic reservoirs are 84·3 per cent full against only 33 per cent at the same time last year. It is estimated, therefore, that the present water reserve is equal to about 1,269 million kWh against only 444 million kWh last year. On the other hand, consumption is rapidly growing and the opening of the Paris-Dijon electric railway line will greatly increase consumption. It is thought, however, that there will be no load shedding this year. According to the latest figures published, France produced 30,000 million kWh in 1949, an increase of 35·7 per cent over 1939.

Motor Show

More and Better-Arranged Electrical Equipment

BESIDES a general tendency to incorporate more electrical "gadgets" in the modern car the main point of electrical interest at the thirty-fifth International Motor Exhibition which until to-morrow is being held at Earls Court, London, is the way in which electrical equipment is now designed to form an integral part of a car and not an appendage. Coincident with the provision of more electrical devices there is also a marked improvement in the grouping and location of the controls so that they not only occupy less space but are more conveniently and readily to hand.

In some of the latest cars it is now possible to have electrical apparatus installed to perform such functions as raising or lowering the windows or hood, moving the seats and bringing into use extensible radio aerials. The incorporation of these aerials in the wings is another step in the general trend towards streamlining and the elimination of projections which, apart from reducing air resistance, make for improved appearance and easier cleaning.

Lamps and Wiring

It is this same tendency which is responsible for the virtual disappearance of lamps as separate items of equipment. Not only are they merging into the wings but, in some cases where there are a half a dozen or so hand, fog and side lamps to be disposed of, into the bumpers as well. Horns, the multiplicity and size of which were once the hallmark of a "super" car, are even more affected and are banished under the bonnet, where they are protected from the weather and need little cleaning. In a few cars there appears to have been an effort to render the electrical wiring more accessible and while this is a move generally to be welcomed it would appear that some risk is involved in exposing the wiring to possible damage during routine servicing.

A large proportion of the individual items of electrical apparatus has already been shown at the Commercial Motor Show, to which we referred in our issue of 6th October, page 551. The increasing use of television apparatus renders the general adoption of interference suppression devices of increasing urgency. Besides producing suppressors for easy fitting to car engines, Joseph Lucas, Ltd., introduce a distributor with a built-in suppressor. Another new Lucas product is a double dipping lighting system designed to promote safer night driving. New shallow fog and driving lamps are shown by Eversure Accessories, Ltd., while Marshal Distributors have a display of French lighting equipment.

A working model of hydraulic electrical equipment for raising and lowering hoods and windows and adjusting the front seat is demonstrated by Wilmot-Breedon, Ltd., a new electrically operated folding head also being shown by Weathershields. Electric brakes operated by hand from the steering column or brake pedal can be seen on some of the caravans.

The "Falcon" electrically operated cigarette lighter marketed by the Hillier Engineering Co., Ltd., is designed to fit underneath the dashboard. On the Trico stand the "Pop-out" lighter is accompanied by redesigned streamlined direction indicators. Among a large number of battery manufacturers Oldham & Son, Ltd., are exhibiting for the first time the "Major" battery, incorporating "Fibrak" separators and fibre-glass retainer mats to armour the positive plates, which enable the battery to be supplied in a dry-charged condition. A new Exide top-up spout is attracting a good deal of attention. In addition to batteries, C.A.V., Ltd., show dynamos, starters, switch and fuse gear and searchlights for marine use.

Car Radio Sets

Among car radio equipment E. K. Cole display a 6-valve superhet model with three pre-set medium-wave stations in addition to free tuning on medium and long waves. An Ekco short-wave set incorporates band-spread tuning and seven short wave ranges. The new World Radio "Motorola" is specially designed to cut out engine interference. Besides "MotoRadio" sets, Philips Electrical, Ltd., make a feature of car lamps and battery chargers.

For use in garages the British Thomson-Houston Co., Ltd., has a complete range of

fractional h.p. motors and control gear. The new Benjamin Electric " Flurolier " type HH fluorescent lighting fitting for twin 5ft tubes, is suitable for unit and continuous run installations and has a slotted reflector to provide a component of upward light, a series of fins on the lower edges of the slots of the reflector giving a horizontal cut-off. Other Benjamin fluorescent and tungsten fittings are also shown, finished in " Crysteel " vitreous enamel, " Coolicon " shades being prominently featured.

An especially comprehensive display of electrical service equipment by Crypton Equipment, Ltd., includes motor analysers which enable a complete test and diagnosis of faults in an average engine to be carried out in one to two hours. Though these analysers are supplied in complete units, the nine separate individual testers incorporated can be acquired separately. A new fault analyser is shown by Wayne V. Myers Co., Ltd., while the English Electric electronic ignition tester which creates the conditions of an actual road test can be seen on a number of stands. V. L. Churchill & Co., Ltd., have a new electronic wheel balancer.

A new Romac portable six-cylinder compressor is supplied with a complete spray assembly for tyre inflation or spraying. Among tools both Desoutter Bros., Ltd., and Kerry's (Great Britain), Ltd., have new drilling machines.

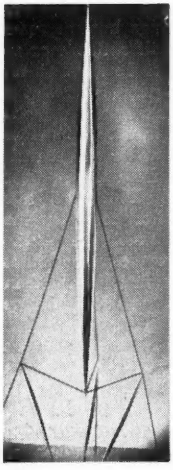
The latest Wolf " Mobilectric " comprehensive valve shop incorporates a 55 deg angle heavy duty driving unit. The new polychromatic stove enamel finish now employed on all Wolf equipment, besides being most attractive, is highly durable and grease resistant.

Festival of Britain Symbol

EARLY in the new year London and its visitors will be able to see the Festival of Britain's 300 ft. high " Vertical Feature " rising on the South Bank Exhibition site between the Thames wall and the great Dome of Discovery. Engineers are now busy translating the designer's ideas for the structure—at present unnamed—into reality in the offices of the British Insulated Callender's Construction Co., Ltd., which has been awarded the contract. Work has already begun at Painter Bros., Hereford, an associate company, and the structure is expected to be completed in time for its erection on the South Bank in the new year.

The structure will be an elongated ellipse of aluminium. It will appear to float in space, for its base will be forty feet above the ground and its slender supports will be invisible even at quite close range. The Feature will comprise a lattice steel framework, ringed round at close intervals with pressed aluminium louvre reflectors. It will be illuminated internally by a series of lamps grouped in clusters of three at frequent intervals round a central steel tube. A burnished aluminium cone below each group of lamps will reflect the light on to the external reflectors.

The lamps will be graded in power from a low intensity of amber light at the bottom, increasing in power and passing through a stage of yellow light over the centre part of the structure, again increasing in power and changing to an intense white light at the top. Before the designs went to the engineers tests of a model in a wind-tunnel were made to discover the behaviour of the structure in high winds. The model withstood winds up to the equivalent of 80 miles an hour, the highest velocity recorded in London in the last ten years.



Model of the "Vertica Feature" which is to be erected at South Bank site

The design, prepared by Powell & Moya, AA. R. I. B. A., was awarded the premium in a competition in which 157 designers, architects, engineers and students took part.

Power Utilization Efficiency

I.E.E. Utilization Section Chairman's Address

WHEN he delivered his inaugural address as chairman of the Utilization Section of the Institution of Electrical Engineers in London recently Mr. A. N. Irens (Bristol Aeroplane Co., Ltd.) emphasized the importance of the efficiency of electrical power utilization. There was no point in striving for that extra 1 per cent in thermal efficiency of generation, he said, if the fuel energy saved was thrown away by inefficient design or careless use of power consuming apparatus.

Mr. Irens first of all appealed to the supply industry to modify its outlook on the question of parallel operation of private plant. There were many instances where, on ordinary economic grounds, the steam required by a factory ought to be produced at a higher pressure and passed through a back-pressure turbine or reciprocating engine to generate electric power before being used for process heating. The overall saving of up to a pound of coal per kWh generated could often show a good return on the capital outlay. Steam requirements never balanced exactly the electrical load and so the ideal arrangement was to run the generator in parallel with the public supply, otherwise extra capital expenditure would be involved.

Encouraging Off-Peak Loads

Turning to our limited generating capacity, he said that, looking at the national load variation, there was clearly much that could be done to fill the hollows and top the peaks and industry, which had already made a magnificent contribution in this direction, should be encouraged by suitably framed tariffs to continue and extend this practice. Going even further, it might be encouraged to take a high load in the summer by the relaxation of demand charges at times when there was generating capacity to spare.

This question of system load-factor improvement was of the very first importance and its solution was a fundamental requirement if we were to enjoy the benefits of a cheap and abundant supply of electricity. Commercial considerations would in due course bring this fact to light very forcibly as the average overall capital cost of generating plant in use was bound to increase, with a consequent rise in maximum demand charges.

In many industries lighting was the predominant load and with modern factories taking full advantage of natural daylight the load factor for lighting alone was relatively bad, unless a night shift was worked. There was much scope for improvement in the way energy and equipment were used for providing light in factories. The advances in the development of light sources, coupled with the increased cost of energy, presented an economic situation which called for the scrapping of a large amount of factory lighting installed when electricity was much cheaper. It was, however, important to take into account the hours of use of lighting each year. A good balance should be struck in terms of money between the time and effort required to produce the electricity on the one hand and the lighting equipment and its installation on the other.

Industrial Heating

With regard to industrial heating, uncontrolled heat in any form was wasteful and it was because electricity was so easily controlled and flexible in use that it was finding increasing favour for industrial processes. This ease of application, however, could sometimes result in the economy of utilization being overlooked and insufficient attention being paid to thermal insulation.

As to motive power, full advantage should be taken of the recent advances in design in relation to duty cycles, special torque conditions and speed control. Supply engineers should look again at their local regulations with regard to motors as in many cases they could be relaxed with beneficial results to all round.

After briefly considering domestic utilization Mr. Irens concluded by expressing the hope that the Electricity Boards would widen the activities of their consumers' engineers and see that they were encouraged to give the best impartial engineering advice to their industrial consumers. There was also scope for consulting engineers to be retained by industrial concerns.

Electricity in America

Productivity Teams' Joint Report

TWO teams which, under the auspices of the Anglo-American Council on Productivity, toured the United States (November–December, 1949) in order to compare British and American practice have issued a joint report.* It is unanimous and petailed and contains 67 illustrations, with the more specialized information in 39 appendices.

Each team consisted of sixteen persons ; that concerned with generation was led by Mr. W. M. Tulip (secretary, North Eastern Division, British Electricity Authority) and that concerned with distribution by Mr. R. B. Richardson (commercial officer, Yorkshire Electricity Board) while the tour included visits to manufacturing establishments, consumers' works, and the Hydro-Electric Power Commission of Ontario in Canada.

It was found necessary to correct misconceptions of the word " nationalization " which seemed to conjure up in the minds of many otherwise well-informed Americans an organization financed and operated by the Government, attended by political interference and patronage.

Technical development in the U.S. is ahead of that in the U.K.; larger generating sets, higher steam pressures and temperatures, " unitized " operation, centralized control, etc., together with higher load factors, all contribute to constantly improving efficiencies and falling cost/kWh generated.

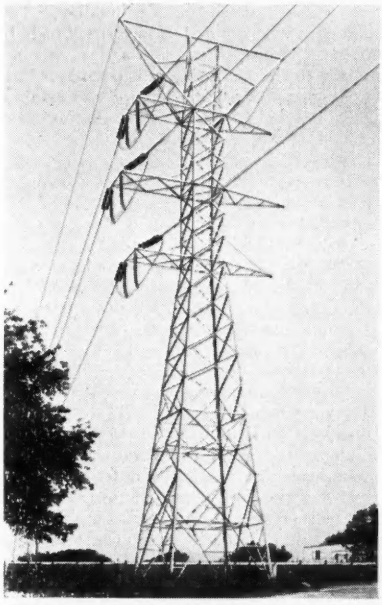
Economy of man-power is very marked at new power stations, resulting from the large size of machines, centralized control and group maintenance. Preventive maintenance is a major contribution to reduced " outage " of plant. Rapid construction is a noticeable feature ; the provision of new stations and transmission lines is not hampered by delays in the preliminary stages, such as occur in this country. The American methods are said to point the way to a severe streamlining of the complex British procedure.

Manufacturers' delivery and erection periods are extremely short ; they are keenly competitive, ready to work by two and sometimes three shifts, are more responsive to purchasers' design requirements and discuss operating engineers' views in advance. The number of staff engaged on design work is very large, with a high degree of specialization. Price levels appear to be more realistic than in Britain, but the report does not compare relative costs because of currency conversion difficulties.

Turbo-alternators are shorter in overall length than equivalent British machines, with consequent saving in building costs. Semi-outdoor power stations, which are being built in a number of places, reduce the cost of buildings and improve boiler house ventila-

*Price 3s 6d post free from Anglo-American Council on Productivity, 21, Tothill Street, London, S.W.1, or B.E.A., Electricity House, Great Portland Street, London, W.1.

O. H. Hutchings' semi-outdoor power station at Dayton in Ohio



Typical steel tower for 220 kV double circuit line for heavy zone loading

tion. A generating station can be completed and commissioned from start to finish in little more than half the time needed in Britain. Typical delivery and erection periods (with British equivalents in brackets) are : boiler 24 (48) months, turbine 24 (42) months, generator/transformer 6 to 9 (30 to 36) months, civil engineering steelwork erection 200 (100) tons weekly, assisted by guaranteed regular supply of fabricated parts from manufacturers' works. The report contrasts this spirit with the almost complete lack of competition between plant manufacturers in Britain.

The smallest new turbo-alternator seen in the U.S. was of 60 MW, equal to the largest standard British set. The report considers that the establishment of a third and much larger standard size of machine with appropriate " unit " boilers and generator/transformer would substantially increase the rate of commissioning of new plant in Britain.

In American opinion a fundamental requirement for the full and rapid economic recovery of Britain is a sufficiency of generating and transmitting capacity ; furthermore, the allocation of capital, labour, materials and whatever else may be needed to install the necessary plant should have priority over any other requirement. In America the industrial worker uses about three times as much electricity as in Britain. To equalize the standard of industrial electrification would mean doubling the amount of energy at present consumed by the whole country. To spread that load growth over a ten-year period would need the addition of 650,000 kW/annum of plant over and above that required to deal with the present load growth.

The annual load factor of most U.S. undertakings is about 60 per cent compared with 40 per cent in Britain. This and the smaller peak demand permit appreciable savings to be made in costs of distribution. Because of the almost complete absence of space heating load and the comparatively heavy refrigeration and air conditioning loads, summer and winter maximum demands are very nearly identical and many undertakings have their peak demand in August.

Overhead mains are used almost invariably in suburban as well as rural areas ; in fact, they are general except in the city centres. Combined high and low voltage lines are run down streets and over private gardens on the same set of poles, ranging up to 40 kV. When the load increases an extra transformer is hooked on to the pole and in cases which were seen every other pole had a transformer. This arrangement is stated to

Making cold compression joint on " live " line with Burndy hydraulic hand press

cost only 25 per cent of the equivalent underground system and is much more flexible.

It is difficult to compare standards of continuity, but there was an impression of a more realistic approach to this problem in the U.S. The solid low voltage underground distribution system adopted in the heavily loaded city centres appears to give a standard which has not been reached in this country. But it is doubtful whether continuity record in the U.S. is as good with the extensive overhead suburban systems as in Britain where the underground system is general. By applying the methods of protection in use in the U.S. the continuity of supply in rural systems in this country would undoubtedly be greatly improved at small cost.

By the end of 1949 it was estimated that 4,980,000 farms, some 85 per cent of the total number, were receiving electricity. In some States the figure was as high as 99·7 per cent. That rural distribution has required the erection of at least 100 times as great a length of overhead high voltage lines as the B.E.A. and the Boards now own in this country. Helped by the American practice of terminating the overhead service at a previously agreed point on the top of a building, a two-man crew with a small service truck installed 15 to 25 overhead services a day, which is several times the rate in this country. From experience of the joint use and ownership of poles for both power and communication circuits it appears that the use of cradle guards on the majority of circuit crossings in Britain could safely be discontinued, especially in view of the greater safety factors in use here.

Wayleaves are obtained more easily and are settled by purchase, no annual payments being made. In the cities it is possible to connect a new service on the day the request is received and in rural areas, where a high voltage extension is required, usually within two or three weeks.

Outdoor meter mounting and the abolition of prepayment meters should be seriously considered in Britain.

Electricity employees are stated to be among the best paid workers for comparable grades in the U.S. They are noticeably keen for the success of their undertaking and there is a highly developed sense of service to the community.

Supervisors and Science

THE 1950–51 session of the Association of Supervising Electrical Engineers opened on 17th October with a presidential address by Mr. T. G. N. Haldane, who after briefly discussing the education and training of electrical technicians (who outnumbered professional electrical engineers by five to one) referred to the Association as a valuable link between the two. He pointed out that the work of engineers in creating conditions for social well-being did not ensure happiness and were only a means to that end.

Most of the address was devoted to a consideration of modern physical concepts in relation to the historical background of scientific thought, some aspects of which are discussed in our leading article. The progress of knowledge, he submitted, had been restricted much more by mental than by technical difficulties. It was, he said, exceedingly difficult for modern people to appreciate the immense intellectual effort that was required to adopt the experimental approach towards science in the 17th century, the revolution taking about 150 years to complete. The present revolution of thought over the past thirty years or so was, in the lecturer's opinion, comparable in magnitude.

The enigmatic behaviour of electrons, Planck's quantum theory, the Heisenberg uncertainty principle and Einstein's theory of relativity provided instances of the obstacles to understanding by those trained in classic physics. Nevertheless, the human intellect was capable of considerable adaptation and probably would, give time, come to terms with the concepts of modern physics. Possibly there was continuous oscillation in scientific thought between the experimental outlook and the outlook that was based on pure reasoning, analogous to what was found in metaphysics. He expressed the views that reality was to be found at the meeting point of thought and experience, and nowhere else, and that nothing in modern science conflicted with a spiritual interpretation of existence.

OVERSEAS ELECTRICAL TRADE

September's Exports Lowest for Five Months

IT was perhaps too much to hope that August's record figure for exports of electrical apparatus and machinery (£12,388,673) would be maintained in September. Almost exactly £1¼ million lower, last month's total at £10,091,558 is £792,907 below that for September, 1949, and is the lowest figure since April. As will be seen from Table I, the decline, compared with September last year, is generally widespread throughout all classifications, notable exceptions being commercial radio apparatus, sound reproducing apparatus, radio valves, cooking appliances, irons, electro-medical and X-ray apparatus, generators over 200 kW, motors over 250 h.p. and motor starting and controlling gear.

Details of the distribution of electrical goods and apparatus appear in Table II, Australia, South Africa and India still remaining the largest buyers. The value of electrical generating plant sent to Russia was greater than to any other country, while South Africa (£94,341) and Australia (£67,509) continue large buyers of motors. The same two countries, taking £281,762 and £127,517

TABLE I.—ELECTRICAL EXPORTS

Class	September, 1950	September, 1949	Class	September, 1950	September, 1949
	£	£		£	£
Telegraph and telephone cables and wires (submarine)	44,583	98,598	House service meters	102,569	136,557
Ditto, not submarine	462,944	904,271	Time recorders and time switches	18,198	20,559
Wires and cables, cotton, silk or artificial silk insulated	43,715	54,320	Other electrical instruments	103,667	88,358
Ditto, enamel, glass or asbestos insulated	52,890	49,056	Electro-medical apparatus (not X-ray)	44,003	29,811
Ditto, paper insulated	472,541	757,379	X-ray apparatus, tubes and parts	48,144	64,263
Ditto, rubber insulated	354,677	333,726	Permanent magnets	19,955	12,269
Ditto, other	116,838	111,915	Insulating cloth and tape	56,334	60,966
Commercial radio apparatus	896,940	340,845	Other insulating materials	69,642	68,636
Domestic radio apparatus	225,775	239,305	Unclassified electrical goods and apparatus	415,274	376,428
Telegraph, telephone and signalling apparatus	1,229,098	1,716,302	TOTAL electrical goods and apparatus	6,660,606	7,217,057
Radio loudspeakers	36,065	22,904			
Sound reproducing apparatus, components, and parts other than cinematograph apparatus	318,457	278,142	Generators, up to 200 kW	410,707	857,379
Other sound reproducing apparatus	67,182	68,789	Ditto, over 200 kW	374,971	170,535
Radio valves	188,051	169,286	Ditto, parts	115,077	87,468
Electric lighting carbons	30,126	13,954	Motors, railway and tramway	22,234	6,557
Lamps not exceeding 24 V	27,946	22,682	Ditto, other, not over ½ h.p.	78,750	49,405
Discharge lamps	36,057	18,161	Ditto, over ½ h.p. but under 1 h.p.	30,050	40,775
Other lamps	71,988	60,045	Ditto, from 1 h.p. to 250 h.p.	332,011	477,945
Other lighting apparatus	261,951	366,665	Ditto, over 250 h.p.	99,122	28,228
Primary batteries	124,549	81,555	Ditto, parts	51,513	104,057
Parts other than carbons	15,847	9,518	Converting machinery	6,676	10,818
Accumulators for motor vehicles	149,737	149,370	Transformers, including coils	567,001	578,307
Ditto traction	17,511	14,410	Rectifiers for power house use	30,821	42,179
Ditto radio	2,555	6,152	Motor starting and controlling gear	194,462	166,731
Other portable accumulators	81,464	66,231	Switchgear and switchboards (not telegraph or telephone)	699,979	722,474
All other accumulators	61,847	45,686	Other electrical machinery	18,010	10,170
Parts and accessories	55,753	61,229	TOTAL electrical machinery	3,061,384	3,383,028
Cooking appliances	99,193	62,732			
Heating appliances	45,348	41,227	Vacuum cleaners and parts	212,369	122,449
Parts and accessories for cooking and heating appliances	52,353	34,114	Other electrically operated portable appliances	85,935	86,062
Flat irons	48,064	31,520	Portable electric tools	71,264	75,869
Commercial electrical instruments	90,776	98,541	GRAND TOTAL	10,091,558	10,884,465

worth respectively, also accounted for a substantial portion of the sales of "other electrical machinery," India (£167,906) being another good customer.

TABLE II.—DISTRIBUTION OF ELECTRICAL GOODS AND APPARATUS

Destination	Sept., 1950	Sept., 1949
Channel Islands	35,689	22,701
Malta and Gozo	7,816	13,315
Cyprus	14,966	8,747
British West Africa	150,996	168,586
Union of South Africa	522,775	817,838
Northern Rhodesia	29,329	41,545
Southern Rhodesia	55,957	113,998
British East Africa	150,876	118,958
Bahrein, Kuwait, Qatar and Trucial Oman	14,514	47,179
India	483,973	613,779
Pakistan	195,618	43,221
Malaya	146,080	319,319
Ceylon	47,720	81,747
Hong Kong	97,800	169,035
Australia	912,675	1,014,934
New Zealand	108,578	487,626
Canada	123,176	89,257
British West Indies	110,095	135,095
Anglo-Egyptian Sudan	48,286	15,142
Other Commonwealth Countries	64,050	124,688
Irish Republic	322,002	175,658
Soviet Union	14,410	55,658
Finland	25,015	35,215
Sweden	105,157	124,529
Norway	112,076	143,919
Iceland	9,515	28,716
Denmark	74,325	92,147
Poland	30,527	63,994
Germany	27,226	12,216
Netherlands	206,251	222,523
Belgium	502,104	69,469
France	91,370	36,618
Switzerland	45,329	18,068
Portugal	111,951	24,035
Spain	11,043	20,572
Italy	43,603	64,351
Austria	23,373	128,184
Hungary	12,915	8,749
Czechoslovakia	13,713	30,404
Greece	131,405	71,231
Turkey	119,082	63,064
Indonesia*	11,155	18,758
Netherlands Antilles	2,960	5,174
Portuguese East Africa	5,347	16,639
Syria	17,498	41,472
Lebanon	24,416	23,619
Israel	27,289	153,415
Egypt	199,132	149,146
Arabia	17,194	22,276
Iraq	10,152	94,203
Iran	58,630	213,680
Burma	5,388	28,050
Thailand	18,990	30,670
China	1,787	189
United States of America	95,903	15,491
Mexico	2,328	8,269
Colombia	7,050	4,000
Venezuela	25,602	63,633
Chile	24,872	36,007
Brazil	125,206	28,220
Uruguay	15,883	18,387
Argentine Republic	165,783	240,676
Other Foreign Countries	138,715	67,043
TOTAL	6,660,606	7,217,057

* Includes Netherlands New Guinea in 1949.

"EXIDE" PROGRESS

RECENT progress achieved by Chloride Batteries, Ltd., was outlined by Mr. H. V. Schofield, director of sales, at a lunch which the company held at the Clarendon Restaurant, Hammersmith, on the occasion of the opening of the International Motor Show at Earls Court. Mr. Schofield said that during the war production of batteries had been doubled without factory extensions, 85 per cent of output being for war purposes.

Satisfactory progress had been made in the standardization of batteries for motors, and improvements in design and performance had resulted from experience gained during the war in the production of equipment designed to meet extreme conditions of climate all over the world. The "Double Life" batteries had been further improved, while the guaranteed life of traction batteries, production of which had been increased by 360 per cent, had been extended from three to four years. The range of standard batteries was being continually increased. Service facilities had been improved by the opening of the Park Royal depot, which handled 14,000 tons of batteries last year and had facilities for first-charging 1,200 6 V batteries at a time. The company was now in its sixty-first year and ever since its early days it had paid a great deal of attention to exports.

Overseas shipments were now five times the value of those in 1938 and represented 33 per cent of output. The company was the largest and most versatile battery manufacturer in Europe. If its progress was to continue the burden of over-taxation would have to be removed in order to make available the necessary capital.

Other speakers at the lunch were Mr. R. E. Dangerfield, chairman, Temple Press, Ltd.; Mr. A. W. Browne, chairman, Chloride Batteries, Ltd.; and Mr. R. T. Lewis of the *News of the World*.

Road Lighting Uniformity

THE Mayor of Wednesbury (Alderman Mrs. E. Price) last week switched on a new system of lighting along five miles of main thoroughfare in the town. The scheme, which has cost £14,000, provides a further link in the plan for mercury-vapour lighting in "A" roads in the area. Similar work is to begin shortly at DARLASTON.

Commerce and Industry

Hydro-electric Plant for Australia

Large Office Automatic Exchange

AN order has just been placed for the main generating units of the third power station of the Kiewa hydro-electric scheme of the Victoria State Electricity Commission. Two 17,778 kVA waterwheel generators are to be built by the Metropolitan-Vickers Electrical Co., Ltd., which has already four similar machines under construction for the same scheme. The generators will be vertical spindle machines and will run at the high speed of 600 r.p.m. They will generate normally at 11,500 V, with a continuous maximum rating of 12,100 V.

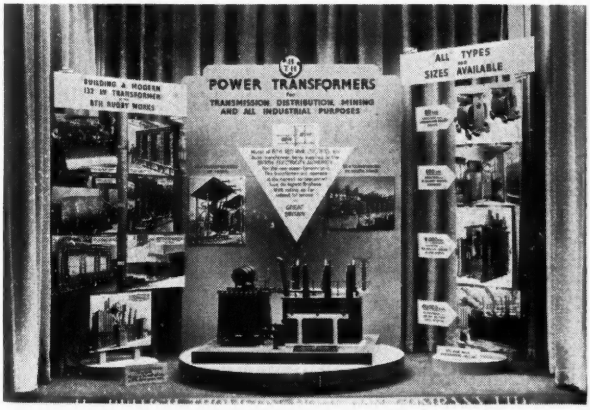
Henley's New Factory

In last week's issue we described the new rubber cable factory at Birtley, Co. Durham, of W. T. Henley's Telegraph Works Co., Ltd. On 16th October there was an opening ceremony performed by the Lord Lieutenant of the county, Lord Lawson of Beamish, who was introduced by Sir Montague Hughman, chairman of the Henley Organization. Afterwards the 300 or more visitors were shown round the factory and saw the exhibition of Henley products mentioned in our article.

At the new Birtley factory: Dr. P. Dunsheath (director and consulting engineer) explains the Henley earth-leakage circuit breaker to Lord Lawson. On the right is Sir Montague Hughman

Transformer Window Display

The current window display at the London office of the British Thomson-Houston Co., Ltd., at Crown House, Aldwych, W.C.2, shows representative B.T.H. power transformers for transmission, distribution, mining and industrial purposes. Photographs on the right draw attention to various transformers for these duties from 60 to 60,000 kVA. On the left-hand side are several views in the Rugby works illustrating various stages in the construction of a 132 kV power transformer. The scale model on the turntable in the centre of the display is a B.T.H. 120 MVA, 132/275 kV, three-phase transformer for the British Electricity Authority, for



B.T.H. transformer window display at Crown House

installation in a substation at the Staythorpe end of the new super-tension grid being erected between Staythorpe and West Melton.

Works Visits

Dr. R. R. Schreiber, the Peruvian ambassador, and Dr. E. E. Buero, the Uruguayan ambassador, visited the Stafford Works and the Nelson Research Laboratories of the English Electric Co., Ltd., on 4th October. They were conducted on their tour by Messrs. E. B. Banks, commercial manager, J. T. Moore, chief engineer, J. K. Brown, director of research, L. H. Short, director of the English Electric Export & Trading Co., Ltd., and C. M. Cock, general manager of the Traction Department.

Diesel Plant for Rhodesia

An order has been received by Dale Electric (Yorkshire), Ltd., from the High Commissioner of Southern Rhodesia, for thirty-four 4 kW Diesel electric generating plants to operate the radio-telephonic link between Bulawayo and Victoria Falls.

Rough Copper Prices

The Ministry of Supply announces that from 18th October its buying price for rough copper in slabs of from 2 to 3 cwt has been raised from £156 to £170 per ton.

A.S.E.E. Branch Merit Competition

The examining board for the Branch merit competition of the Association of Supervising Electrical Engineers has awarded the silver cup to the Leeds Branch for the best all-round record for the year 1949-50, giving second place to the Central London Branch, Manchester, South West London and North West London Branches tied for third place. The cup was presented to the winning Branch by the retiring president of the Association, Mr A. G. Ramsey, at the opening meeting of the London lecture session on 17th October, at the Lighting Service Bureau. This is the second time that Leeds has held the cup, having won it for the year 1944-45.

Gt. Yarmouth Pier Lighting

A total of 1,236 " Royal Ediswan " lamps are in use on and in the buildings of the pier at Gt. Yarmouth. Coloured lamps, floodlights and spotlights are used in the installation. The bulk of the lighting installation work was carried out by the Britannia Pier electrical staff.

E.W.F. Dinner

The annual general meeting and dinner of the Electrical Wholesalers Federation will be held at the Savoy Hotel, London, on 15th March next.

Large Private Telephone Exchange

What is claimed to be the largest private telephone exchange in this country has just been brought into service at the new Government offices being erected on the Victoria Embankment, London. Manufactured and installed by Standard Telephones & Cables, Ltd., this exchange is fully automatic and provides for a maximum of 3,000 internal extensions with 33 manual positions. Provision is also made for 400 tie-lines to allow

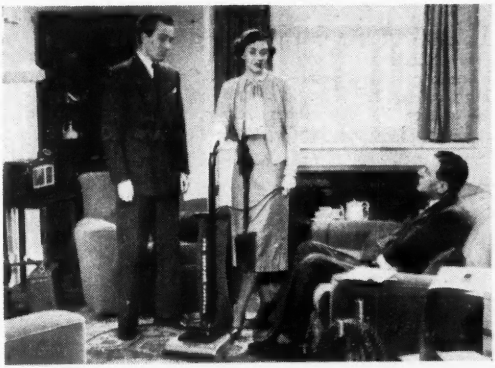
Telephone exchange recently installed in the new Government offices on the Victoria Embankment, London

direct dialling to other Government offices in London, with special equipment for long distance working. Although this exchange has access to the public telephone network through Trafalgar exchange, all toll and trunk calls are controlled by its own operators. A feature of the installation is the directory and inquiry tables on which are mounted a number of revolving drum files capable of containing some 12,000 records.

Hoover Films

Additional films for the use of dealers, women's institutes, technical institutes, trade and technical associations, schools and other interested bodies have just been completed by Hoover, Ltd. "It's About Time" is a direct sales film designed to sell the new Hoover cleaner. Its dramatic and humorous approach appeals to the emotions while using the entertainment film technique to give effect to its sales message.

In "Consider The Carpet" the approach is indirect. It shows the history and construction of carpets and describes the various dirts in carpets and the ways of removing them. In both films the use of commentary has been adopted in preference to dialogue to facilitate the preparation of foreign language versions.



A scene from the Hoover film "It's About Time"

Flameproof Equipment Display Unit

The Simplex Electric Co., Ltd., has produced a new flameproof equipment display unit on which are mounted samples of its flameproof lighting fittings, conduits, etc.

Engineering Industries Exhibition

A very comprehensive range of electrical equipment was to be seen last week on the 150 stands at the third London Regional Display of the Engineering Industries Association at the New Horticultural Hall, London. Apart from a large number of electrically operated metal and wood working tools, industrial equipment included motors, control gear, cable trunking, furnaces, welding apparatus, fans, pulley blocks, roll feed mechanism, battery operated trucks and lighting units.

Photo-electric absorptiometers, gas analysis apparatus, stroboscopes, electronic flash units, dynamic balancing machines, moisture meters, communication measuring apparatus, contactors, sensitive relays, temperature control gear, process timers, smoke detection apparatus, liquid level control equipment, carbon monoxide detectors, weld timers, and electro-magnetic counters were among the many examples of electrical instruments.

On the domestic side there were several types of convection heaters, an instantaneous water heater, floor polishers, irons, etc. Among accessories was a new ceiling rose which automatically switches off the electricity if a fire or other heavy current consuming apparatus is plugged in. Fluorescent lighting equipment and animated signs were other exhibits.

Hard Metal

Recently we had the opportunity of seeing a 16 m/m colour film entitled "Hard Metal" which has been produced by Gateway Film Productions for Murex, Ltd. The film, which runs for approximately 45 minutes, shows in detail some of the processes in the quantity production of tungsten carbide (known as hard metal), and some "Prolite" tools, dies and wear-resisting products at work in industry. The commentary is clear and is couched in terms which are easily followed by a non-technical audience. The various processes are made clearer by the use of animated diagrams showing the path taken by the chemicals during their journey through the plant. The film can be hired for showing by educational authorities and in social halls, and applications should be made to Protolite, Ltd., Central House, Upper Woburn Place, London, W.C.1, who are the distributors for "Prolite" in the home market.

American General Electric Laboratory

The research laboratory of the General Electric Co., Schenectady, New York, is celebrating its fiftieth anniversary this month, and the celebrations have been attended by many eminent scientists, including Sir Lawrence Bragg from this country. As part of the celebrations the National Academy of

Sciences held its autumn meeting in Schenectady, and Mr. C. E. Wilson, president of the American General Electric Co., dedicated the new quarters of the company's research laboratory. The new building is five storeys high and has 159,000sq ft of usable floor space. It houses 107 laboratory rooms, while the radiation laboratory will house the new 30 million V synchrotron.

Consulting Engineers

The 1950 list of members of the Association of Consulting Engineers is now available and can be obtained from 36, Victoria Street, London, S.W.1, at 1s by members and 1s 6d by non-members.

Trade Announcements

Dewhurst & Partner, Ltd., have opened a branch office for the North Midland area at 118, Nelton Road, West Bridgford, Nottingham (telephone : Nottingham 88360). The office is under the control of the company's resident engineer and manager, Mr. A. Owen.

Ekco-Ensign Electric, Ltd., inform us that the initials of Mr. Gaunt, whose appointment as their representative for part of the Manchester and Salford area we reported in our issue of 13th October, are "W. E." and not "R. W." as they stated.

A new depot has been opened by **Winter Trading Co., Ltd.,** at 58, Pershore Street, Birmingham, 5. Mr. M. Treadaway will be in charge of the stores, and the local representatives, Mr. Kennedy of Stourbridge and Mr. Johnson of Birmingham, will in future operate from the Birmingham branch.

New depots will shortly be opened by **Aerialite, Ltd.,** at 343, Deansgate, Manchester (telephone : Blackfriars 3524), and at 50, Cathays, Redcliffe, Bristol (telephone : 26130).

The address of the Newcastle office of **Richard Sutcliffe, Ltd.,** is now 17, Sandhill, Newcastle-upon-Tyne.

A.S.E.E. Kent Branch

Members of the Association of Supervising Electrical Engineers met at the Star Hotel, Maidstone on 12th October for the annual dinner of the Kent Branch. More than 100 members and friends were present. Proposing the toast to the Association, Mr. C. Cameron-Kirby, deputy manager, Kent Sub-Area, South Eastern Electricity Board, said that there was a tendency these days to place more and more emphasis on the administrative side of the industry and to attach too little importance to the work of men such as members of the Association who formed the backbone of any concern.

Mr. W. F. Parker, vice-chairman of the Association, in responding, said that in the old days there was intimate contact between employer and employees, but to-day through expanding business, and particularly through nationalization, that was diminishing. He felt that the engineer was deserving of greater status and recognition.

Mr. A. Brammer, general secretary of the Association, proposed the toast of the guests, and Mr. P. G. Wallis, president of the Electrical Contractors' Association, responded.

The New House of Commons

Referring to our article last week on the new House of Commons building, William Steward & Co., Ltd., tell us that they carried out the installation of all the wiring in connection with automatic controls supplied by the Watford Electrical Co., Ltd., for the air conditioning plants, and also for the temperature and humidity detectors and recorders supplied by Negretti & Zambra, Ltd. This wiring entailed the use of about 20 miles of cables supplied by W. T. Henley's Telegraph Works, Ltd., in fourteen special colours. This is in addition to the 25 miles of cable mentioned in our article.

Catalogues Wanted

Vacuums, Ltd., Aldridge Road, Birmingham, 22B, ask for catalogues, prices, etc., of electric domestic appliances for purchase and re-sale through their selling organization.

Catalogues and Lists

Automatic Telephone & Electric Co., Ltd., Strowger House, Arundel Street, London, W.C.2.—Illustrated catalogue (No. 1149) of radio and electronic products.

Sumo Pumps, Ltd., Lighthouse Works, Smethwick 40, Birmingham.—Technical brochure on submersible pumps.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2.—Catalogue of industrial and commercial fluorescent lighting equipment and two folders on neon sign cables and hard drawn copper conductors.

Devroome Developments, Ltd., Crompton House, Aldwych, London, W.C.2.—Catalogue of "Ulti-Meg" insulating varnishes and impregnants.

Nettle Accessories, Ltd., Harper Road, Wythenshawe, Manchester.—Catalogue and price list of "Nettle" shock-proof electrical accessories. Also priced folder on Edison screw lampholders.

Abbott, Birks & Co., Ltd., 90-91, Blackfriars Road, London, S.E.1.—Priced and illustrated catalogue of tools and equipment for gas, oil, water and electricity undertakings, main-laying contractors, engineers, railway and shipping stores, etc.

ELECTRICAL CONTRACTING: Organization and Routine*

By H. R. TAUNTON, A.M.I.E.E.

14.—Material and Plant

ONLY one person in the firm should be its buyer. He may be a principal, but, if not, he should be the manager or chief engineer. The office is one of great responsibility, and the holder of it must be above suspicion, one who, if he has not an actual interest in the firm's profits, is at least sufficiently well paid to raise him above any likely temptation.

The estimators and supervisors responsible for the various jobs can be left to decide what types and makes of material are necessary to meet the conditions known to them. The buyer has the check on them: routine orders for work in progress that he alone can sign. Those for which he must take sole responsibility are for material—(*a*) for replenishment of stock; (*b*) in quantities which may qualify for special discounts or rebates; (*c*) of more than normal value, such as a main switchboard, or a selection of special fittings; and (*d*) covered by annual or periodical contracts.

He will deal with (*a*) as he receives requisitions from the storekeeper; with (*d*) as the various buying contracts begin to expire; and with (*b*) and (*c*) as the occasion arises, usually consulting any members of the staff who have an interest in them. No good his ordering for a job a make of oil engine which he prefers when another make is specified. In ordering any particular article for stock he should not ignore the opinion of the foremen. Their practical experience is a more reliable guide to its merits than the maker's eulogy.

To do his job properly, the buyer must have a full knowledge of all possible sources of supply. Not every maker produces himself all the articles he catalogues as his. The experienced buyer will go direct to the smaller people who do actually make them, and so save an intermediate profit if he can. They rarely advertise and relations with them are often only to be gained deviously. For the knowledge of electrical markets which he needs, however, the buyer has to rely mainly on the more usual channels of catalogues, suppliers' representatives, and the advertisement pages of the technical Press.

Catalogues

An intimate knowledge of makers' catalogues is essential to him. The buyer who has it will, when an engineer comes to him and suggests that some weird cross between a ceiling-rose and a motor-generator will have to be specially made, be able to pick out an obscure maker's list and put his finger on the very article—or at least something as near it as the consultant's own idea of it.

The whole question of catalogues and how best to keep them is extraordinarily difficult. (To keep—in the literal sense of the word—fittings catalogues is a problem in itself: nobody to whom they are lent ever thinks of returning them.) The difficulty has two chief causes: the needless variety of format adopted by different publishers and the quickness with which their contents, and especially their prices, become out of date.

The manufacturer who wants his publications kept should make them easy to keep. Awkward shapes and sizes and flimsy bindings are a nuisance on a bookshelf. There is no real reason why catalogues should be of more than two sizes, quarto and octavo; and every catalogue should have a binding, whether boards or cloth or manila, stiff enough to allow it to stand on its own bottom. Again, if the back of the book is not wide enough to carry a title, some other means of distinguishing it at a glance is essential, something more original than the usual browns and greys. Such devices as a different-coloured stripe or a projecting tab quickly impress themselves on the memory

* The last article in this series appeared in the *Electrical Review* of 15th September.

of the user. In short, the first cause of difficulty would be largely removed if suppliers would only ensure that their catalogues will stand stout and upright where they are put, and be easily found there when they are wanted.

The second cause, however, is less amenable to easy treatment. The problem is primarily one for the publishers of the catalogues, but their usual solution of it is to shift to the user the trouble of keeping them corrected and up to date. They will send him a bundle of loose leaves and expect a typist to be detailed for an hour's work binding them in place; or folders and printed slips, with or without adhesive, to be fixed in their scattered publications. All these appeals to the co-operation of the user are doomed to failure. The average contractor has neither the time nor the inclination to act as honorary librarian. He has the average human component of inertia, and he finds it easier to use the waste-paper basket.

The manufacturer's point of view demands a certain sympathy. He cannot be continually issuing new editions of his catalogue with every new development and every fluctuation in price, yet at the same time he must supply his customers with the latest information about them. He will not, however, satisfactorily solve the problem by any great tax on their energy or goodwill. A possible solution is to persuade them to take the little trouble to return the catalogue for corrections or additions when necessary, facilities being provided.

Travellers

The buyer's third point of contact with the markets is through the representatives of makers and wholesalers. They will call on him in their thousands, and if he were to be at home to all of them he would never get time to write out an order for any of them. But he should see as many of them as he can find time for. Obviously, he must interview the man from whom he has received a quotation he is considering; and he will, as a rule, welcome the representatives of his usual suppliers. They are the men who can be useful to him, not only by keeping him posted in the latest developments of their firms but, if they are friendly, they will often pass the word to him of possible inquiries of which they have got wind in the course of their calls on architects or consultants. It is true the value of such tips is discounted by the probability that other favourite customers have been given them. If he can manage it, too, he will see the representatives of firms he knows by repute or from some recent advertisement which has caught his eye.

Stock Lines

For the average contractor, quantity buying is applicable to only a few items of the varied material he uses, the stock lines which form the bulk of it: conduit, cable, lamps, lampholders, switches, sockets, and so on. Here " stock lines " does not simply mean lines which are stocked, but makes and patterns of material which have been chosen as the firm's standards for use on all jobs where they do not conflict with special specifications. That choice is clearly a matter of the most careful judgment. Labour-saving points, efficiency, durability and appearance will all be considered; but quality as a function of cost will often be conditioned by the class of work the contractor normally undertakes. The chief factor in the decision of a firm whose work is mostly done to specification will be the average requirements of consultants and architects.

So long as the initial conditions remain unchanged, a stock line once adopted should not be changed without strong reasons. The convenience of a known standard continuous over a long period is obvious—e.g., wall sockets—and the easy handling born of familiarity means a saving of labour on the part of the staff.

Let us suppose the buyer is considering his firm's requirements of 5 amp flush switches for the coming year, and, other things being equal, is open to place the order with either " A," " B," or " C " on price alone. He has, first, to determine the maximum quantities he can safely order, based on the numbers of each type used during the last two or three years. He will then invite the three suppliers to quote for what he wants, stipulating that deliveries shall be spread as required over the given period. If the quantities are respectable, entitling him to " quantity buying terms " under the Fair Trading Policy, be sure that the suppliers' representatives will presently be on his doorstep to qualify their firm's written offers, for, as a rule, even the largest firms prove to be wonderfully elastic in their terms when it comes to bargaining for a worth-while order.

The matter now drifts into the sphere of

business ethics. How far may a buyer legitimately go in his attempt to squeeze the last fraction of discount from competing sellers? A dozen questions obtrude themselves. A buyer with a quantity order to place will sometimes tell A's representative the lower price that B has quoted, inviting him to undercut it. Is that fair? (What would a contractor say if an architect gave a competitor of his a similar chance of undercutting him?) Some buyers will even give to one man a figure as the other's lower quotation which is purely fictitious. Is that, not simply fair, but even honest? We have, thank heaven, no mission to reform commercial morality, so let us get back to less debatable ground with another question: Is it fair trading on the part of the maker to offer a buyer terms better than he would allow the wholesaler to give?

The Wholesaler

That opens up the whole question of the relations between maker, wholesaler and contractor. The wholesaler claims that he is an essential link between the other two, giving service to both, the difference between the discounts the maker gives him and the contractor being his reward—that, and a tolerable amount of abuse from both parties. If, then, the contractor with a large order goes—as he legitimately can go—direct to the maker and secures terms the wholesaler could not give him, it must be admitted the latter has a substantial grievance. But in such cases the contractors do not pass over the wholesaler out of sheer malevolence. They have learnt from experience that many makers, driven by competition, will give them for a good order something better than their usual quantity terms. Can contractors be blamed for trying to get them?

Another complaint of the wholesaler is that whenever contractors want some special item, a valuable item, perhaps, though no question of special terms is here involved, again they go direct to makers. If he is to depend solely on jobbing lines he cannot secure an adequate return for his valuable services. The contractors' obvious reply is that when they want special material which they know the wholesaler cannot be expected to stock, they would simply be wasting time if they waited while he got it from the makers for them, which they could as easily do for themselves. The wholesaler fills an important role in the industry, and he should be supported in it. Makers would be very sorry if they had to undertake themselves the trouble and cost of distributing their wares to retailers; and so would contractors be if they either had to stock a thousand petty items in quantities or else incur the delay and cost of postal order and delivery.

When the quantities required cannot be accurately gauged, a sliding scale of rebates should be arranged if possible, to make sure of getting the maximum discounts for the maximum purchases. Some makers publish scales of rebates on yearly total purchases of their goods of all kinds and most can be induced to negotiate similar scales. A well-known example of the system is that of the Cable Makers' Association, and there are, of course, others. Particularly favourable terms, the subject of special agreements, are enjoyed by contractors who are members of the National Electrical Contractors' Trading Association.

These schemes all naturally involve certain restrictions. It is for the individual contractor, in considering his annual buying policy (particularly of cable and lamps) to decide whether he will gain more by their special terms than he will lose by being unable to buy where he likes. It will depend largely on the class of business he normally undertakes. If agreements are signed, purchases under them should be watched, and during the last week or so of the agreed period the accountant should furnish a return showing their total to date, in case special action is necessary. For example, that return may show that up to the middle of December the firm has bought £460 worth of a certain class of cable. Another £40 worth would qualify it for, say, an extra $1\frac{1}{4}$ per cent rebate. The buyer then has to decide whether it is worth while placing an order for stock to that amount, and so secure some £6 more in rebate. He will perhaps decide that it is, hoping to improve his turnover in the following year.

Responsibility for Plant

The buyer is indicated as the most suitable person to be ultimately responsible not only for the organization and upkeep of the stores, but for the plant, tackle, and tools necessary to the efficient working of the business. "Tools"—the larger tools which are the property of the employer, as distinguished from those in the electricians' kit, together with instruments, tackle, and other special apparatus—have an uncomfortable place in a contractor's organization. There is no

making a profit out of them; they spend most of their time wandering at large, at the mercy of workmen, and are apt to disappear mysteriously. Tools and their owners are soon parted. Without a strict system of recording their whereabouts, losses on them in the course of a year may amount sometimes to an irritating total.

The commonest tools supplied by the employer are stocks and guides, for conduit threads of various sizes. A contractor in a reasonable way of business may have five or six dozen sets of them in store or circulation, representing alone a capital outlay well worth a little trouble to preserve intact. Other common tools usually supplied by the employer are pipe-vices, portable benches, electric drills, blow-lamps, and such special or expensive items as Cooke's cutters, expanding bits, etc., the character and quantity varying with the business. Tackle varies in the same way. Ladders, steps, and trestles are the commoner items; but derricks, winches, and hoisting gear, and such sundries as watchman's braziers and hurricane lamps may be essential equipment to some firms.

All this means bulk and its permanent possession implies the occupation of a yard or shed. The alternative is to hire tackle as it is wanted from builders, builders' merchants, or firms which specialize in this service. To avoid waste of hiring money, however, intelligent co-operation on the part of the foremen is essential. They are apt to order all the tackle they want long before they can fully utilize it and to hang on to it until the last lamp is inserted in the last holder.

Care of Instruments

Hiring is also necessary at times to avoid unremunerative expenditure on special instruments rarely used, such as a recording voltmeter; but most contractors will own at least one testing set. It, and any other instruments carried as permanent plant, should receive the special treatment called for by their delicacy, to say nothing of their cost. They are apt to become temperamental if they are slammed about by a callous stores-boy, like so many cast iron boxes. If it is possible to avoid it, they should not be sent unattended by train.

All tools, instruments, and tackle should be stamped, labelled, branded or in some way permanently and unalterably marked as the property of the firm. Every article should also bear a distinguishing serial number. A special book should be kept in the stores listing all tools, etc., each with its distinguishing number, description, date of purchase and original cost. For accountancy purposes the total cost shown is subject to annual depreciation, but for working purposes the original cost is more convenient in booking the items in and out.

The actual recording of the movements of tools may be done in either of two ways:—

(*a*) Tools may be ordered from "Stores" against requisitions and booked out like any other article from stock. From the order counterfoil they will then be entered in the cost ledger to be credited on return. If they are lost the cost of the job suffers accordingly.

(*b*) They may simply be advised (without a preliminary order) in a special advice-note book. No notice of them will be taken by the costing clerk until the end of the job, when he will look through its counterfoils. Any that are not cancelled will indicate the non-return of the items advised on it and their cost will then be transferred to the cost of the job, preferably through a corresponding order on "Stores."

METAL CERAMIC MATERIALS

MODERN engineering methods and techniques have created a growing, and as yet unfulfilled demand for materials which will operate satisfactorily at temperatures above those at which the present high temperature alloys may be used. Perhaps the ideal method of overcoming this problem is to combine the most desirable features of both metals and ceramics. It is not surprising therefore that considerable interest is being shown in bodies in which metals and ceramics are intimately associated.

This virtually new class of materials has for some time now engaged the attention of the Morgan Crucible Co., Ltd., and it has registered the trade name "Metamic" to cover its metal-ceramic products. The company is developing these materials to cover a wide range of applications. Its use for turbine blades is but one example and this may enable turbine operating temperatures to be raised to such a degree as to effect a considerable fuel economy.

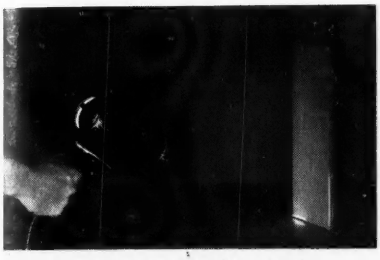
It must be understood, however, that the numerous combinations of metal, ceramic and methods of manufacture will permit of a wide variation in the properties and fields of use of this new material. Thus, for particular uses, one may desire resistance to oxidation, corrosion, erosion, or creep, the formation being varied to meet these requirements.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Black Light Torch

ONE of the standard tests for flaws in castings is based on the fluorescence of oil when exposed to ultra-violet light. A conveniently portable ultra-violet torch for this purpose has just become available from HANOVIA, LTD., 3,



Hanovia "Black Light" torch

Victoria Street, London, S.W.1, which comprises a small high-pressure quartz mercury arc burner in a ventilated baffled casing with a Wood's filter before and pistol grip below. It weighs 2 lb and is effective up to a distance of several feet even in diffused daylight.

The complete unit is rated at 110 W and requires a small transformer for its operation. It is priced at £30.

Battery Watering Gun

The difficulty of accurately topping up traction battery cells in situ can be overcome by the use of a new watering device which is available from CHLORIDE BATTERIES, LTD., Exide Works, Clifton Junction, Manchester, which automatically indicates when the operation has been completed.

It comprises a metal tube and a short spout mounted at right angles on the end through which water is gravity fed to the battery and the flow controlled by a push-button operated stop-cock in the handle.

As the water enters the cell the acid level rises until it reaches an electrode in the spout where it completes an electrical circuit and lights a bulb, thus warning the operator that the correct level has been reached. The current for this purpose is provided from the battery itself. For Exide traction batteries three different lengths of nozzle may be required, and the gun is fitted with two rubber spacing washers that enable the right nozzle length to be provided.

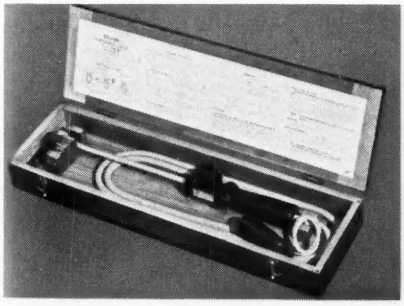
Hearing Aid

Measuring only 3in by 2in by $\frac{5}{8}$in and weighing only 4 oz, a hearing aid developed by "OSSICAIDE," 1, Upper Richmond Road, London, S.W.15, is claimed to be the smallest in the world. The apparatus incorporates three Mullard miniature valves and is operated by two minute dry batteries. The earpiece is smaller than a sixpence. The price is 30 gns.

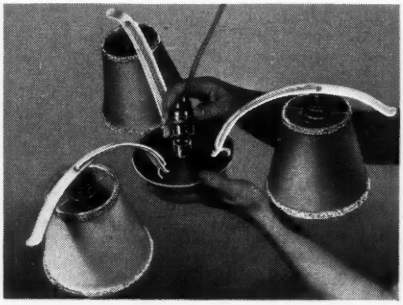
Plug-in Three-Light Fitting

Weighing only $1\frac{3}{4}$ lb with lamps, a "Cobra" three-light fitting produced by the OSBORN MANUFACTURING CO., LTD., Highgate Square, Birmingham, 12, is arranged to plug into an ordinary lamp socket. Its coloured plastic

Exide battery watering gun



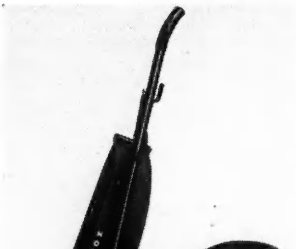
"Cobra" lighting fitting



shades are detachable from the polished wood or chromium plated centre piece and the whole unit is packed in a carton 6in by 6in by 16in. It retails at 42s (plus 9s 4d P.T. in the U.K.).

Vacuum Cleaner

Special features of a new model of the "Junior" vacuum cleaner (Model 119) brought out by HOOVER, LTD., Perivale, Middlesex, are its lightness, self-adjusting nozzle to suit all thicknesses of carpet pile, streamlined design, a convenient foot switch and efficient cleaning



Hoover "Junior" cleaner

tools for curtains, upholstery, etc. The machine works on the Hoover principle of triple-action cleaning which employs beating, sweeping and suction. The price is 15 gns (plus £3 18s 9d P.T. in this country).

Table Lamp

An all-"Perspex" table lamp produced by FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1, has an attractive solid cream fluted dish exterior and satin silver metalwork. It is 12in high and incorporates a switch in the base. The price is 78s (plus 19s 6d P.T. in this country).

Miniature Cap Lamps

The latest refinement to the range of miniature cap lamps made by NIFE BATTERIES, LTD., Redditch, which are extensively used in mines, is a new one-piece combined bezel and lens which is screwed on to the cap lamp headpiece. Moulded from "Perspex" it is extremely robust, increases the lamp's candle power by about 10 per cent, and provides light diffusion over a very wide angle without glare.

It is also announced that the "Nife" high candle-power headlamp, Type N 20, is now fully approved by H.M. Inspector of Factories for use in inflammable atmospheres containing petroleum spirit.

Fluorescent Fittings

Two new fluorescent fittings are announced by SCEMCO, LTD., Soho Street, London, W.1. When dismantled the "Stockist" 4ft 40 W unit fits compactly into a 2ft by 6in by 6in box. The price is £4 2s, complete with tube (plus 3s 6d purchase tax on tube in this country). A new circular industrial fitting, with an 80 W circular fluorescent tube attached by means of clips, sells at £7 12s 6d (plus P.T. on the tube).

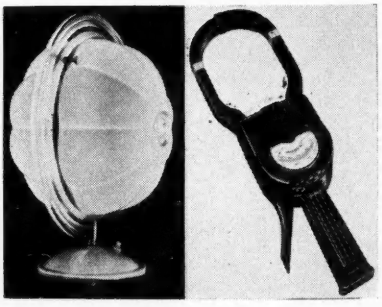
Universal Flameproof Plug

A new type of universal flameproof 100 A restrained plug, designed in accordance with B.S. 279 : 1947, is now available from BRITISH JEFFREY-DIAMOND, LTD., Stennard Works, Wakefield, Yorks. It is particularly suitable for use in medium voltage systems requiring a readily attachable and detachable cable entry and has been designed principally for use underground with coal cutters, conveyors, outlets from gate-end panels, room switches and other control units.

Clip-on Ammeter

The latest addition to the range of clip-on ammeters made by FERRANTI, LTD., Hollinwood, Lancs, has been specially designed for use on porcelain-clad fuses which are too large for the normal type of instrument. It will accommodate fuses and conductors of up to 4in in diameter and has seven ranges of measurement up to a maximum of 1,000 A, 50 to 70 c/s.

Falk, Stadelmann all-"Perspex" table lamp and (right) Ferranti clip-on ammeter



CONDITIONS IN AUSTRALIA

Large Extensions Planned

AUSTRALIA still remains the largest export market for United Kingdom goods, and the report on the economic and commercial conditions in Australia,* prepared by members of the United Kingdom Trade Commissioners' offices in Australia, under the general supervision of Mr. J. B. Greaves, United Kingdom Senior Trade Commissioner in Australia, is therefore of considerable interest to British exporters of electrical equipment.

Wartime conditions and post-war difficulties have accelerated the growth of Australia's manufacturing industries. The production of domestic refrigerators increased from 29,500 in 1938–39 to 145,000 in 1948–49, and of electric cooking stoves from 8,800 to 37,000. The availability in Australia of copper, silver, tungsten, beryllium and various non-ferrous alloys used extensively in electrical apparatus is a factor favourable to the future expansion of the industry.

The output of coal, though greater than before the war, is far from adequate. Large quantities are needed for the generation of electric power, which has increased from 4,688 million kWh in 1938–39 to 9,043 million kWh in 1948–49. Long-term power projects include the Snowy River hydro-electric scheme, which it is estimated will provide 1,720,000 kW, and the Clarence Gorge scheme (estimated maximum capacity 250,000 kW). Shorter-term schemes involve expenditure of over £A194 million and are expected to increase the present capacity from 1,978,223 kW (1948) to 5,894,923 kW (1957). The shorter-term schemes include extensions at Bunnerong station in New South Wales, new stations at Pyrmont (200,000 kW), Newcastle (350,000 kW) and at Lake Illawarra, south of Sydney (150,000 kW).

In Victoria, the most important scheme is the Kiewa hydro-electric project which by 1958 will provide 289,000 kW. It is also planned to double the Yallourn station capacity of 175,000 kW. Queensland projects include new power stations at Tennyson (ultimately 240,000 kW), Bulimao (240,000 kW) and Townsville (52,500 kW). A power station is being built near Adelaide, South Australia, with an estimated ultimate capacity of 180,000 kW, of which 120,000 kW will be installed by 1957. A station of 100,000 kW is being built at South Fremantle in Western Australia, to which a further 50,000 kW will be added by 1957. In Tasmania the biggest scheme at present is the building of a new station at Tungatinah on the Nive River, which will have an initial capacity of 100,000 kW.

The expansion of Australia's manufacturing capacity is bound to alter the scope and pattern of her import trade and the United Kingdom will be directly affected, particularly in relation to many types of consumer goods. There is greatly increased demand for capital goods from the United Kingdom and with the plans for electricity generation projects within the next ten years, it seems certain that the demand for electrical plant and equipment from the United Kingdom will be increased even further. Of the total imports of electrical machinery, appliances and equipment valued at £A17·2 million in 1948–49, the United Kingdom's share was £A15·0 million as against £A10·3 million and £A7·8 million respectively in 1947–48. The 1948–49 total includes £A5·1 million for electrical machinery and appliances, £A3·9 million for cable and wire (covered), £A3·8 million for dynamo-electric machines and £A3·5 million for telegraph and telephone instruments, etc.

The report points out that the United Kingdom exporter cannot remain satisfied or complacent simply because at the present time he is enjoying a substantial trade and a large share of the Australian market. Competition of some important supplying countries, notably the United States, Canada and other hard currency nations, and Germany and Japan, is not at present very significant; but goods from the last named countries are already beginning to reappear, and any solution of the dollar problem will undoubtedly revive keen competition from the hard currency areas. It is emphasized therefore that exporters would be wise to lay their plans on the assumption that business in the Australian market will in future demand the exercise by them of the greatest initiative and unremitting effort.

* Published for the Board of Trade Commercial Relations and Exports Department by H.M. Stationery Office at 4s. net.

Tasmanian Power Contract

THE Swedish International Press Bureau reports that the Hydro-Electric Commission of Tasmania has placed an order with the Swedish ASEA concern for three vertical 25,000 kW generators for the new power station at Trevallyn. The first unit is to be delivered by 1953. The tenders of two French companies, Compagnie Industrielle Travaux and Enterprise Fongerolle, amounting to some £750,000, have been accepted for the construction of a two-mile tunnel in connection with the scheme.

NEW BOOKS

Hydro-Electric Handbook. By W. P. Creager and J. D. Justin. Second Edition. Pp. 1151; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price £5.

Since the first edition of this handbook was published in 1926 it has been accepted as one of the few authoritative standard works on water power development in the English language. The appearance of the second edition after a lapse of 25 years is, therefore, most welcome. The material has been brought into line with current practice and rearranged to fit in with the general method of investigation and development of any given project. This has enhanced the usefulness of this book which is truly encyclopedic of the various problems which have to be studied during the project stage and in the execution of the civil engineering works. The mechanical and electrical aspects are also adequately covered.

The contents are divided into three sections. The first examines the different factors which must be known before study of a project can be started. It includes such subjects as site explorations and methods of evaluating rainfall, evaporation, run-off, river discharge, flood flows and storage, as well as the assessment of losses and of the net head. The inclusion of a comparative economic study of hydro-electric and thermal plants extended to cover market requirements and optimum plant capacity is an extremely valuable summary for those called upon to prepare project reports.

The second part of the work is a condensed version of Creager, Justin and Hinds' well-known classic in three volumes entitled "Engineering for Dams" and it is, therefore, sufficient to say that the summary is a comprehensive and effective treatment of dam design and construction.

The third section is devoted to the mechanical and electrical aspects of hydro-electric power development and provides an ample introduction to specialized treatises on various types of dam and intake gates, wood stave and steel pipelines, canals and tunnels, as well as waterhammer and surge tank problems.

Separate chapters on the general design of power station substructures, superstructures and hydraulic plant are followed by sections dealing with generators, transformers, ancillary plant and transmission lines in sufficient detail to provide a full appreciation for the complete development of a project for those not closely associated with these fields of engineering. An unusual and valuable chapter is devoted to the operation of hydro-electric plants, a subject which is much neglected in current literature, despite its economic importance.

The book is liberally provided throughout with nomograms, graphs, tables, drawings and references which will be of considerable assistance to engineers charged with the design, construction, or operation of water power developments and, as such, is to be thoroughly recommended.—B. D.

Automobile Electrical Equipment. By A. P. Young, O.B.E., M.I.E.E., M.I.Mech.E., and L. Griffiths, M.I.Mech.E., A.M.I.E.E. Fourth Edition. Pp. 386; figs. 350. Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 25s 0d (postage 8d).

First published in 1933, this book rapidly became established as a standard work in its field. It has been completely revised and brought up to date with a large amount of entirely new material. The book deals exhaustively with every aspect of generation, lighting, starting and ignition as applied to automobile engines, and is invaluable to students, designers, repairmen and owner-drivers. Among the more recent developments described in detail are radio interference suppressors for motor vehicles, modern sealed-beam headlamps, and fluorescent lighting.

Books Received

Les Machines Electriques des Réseaux. Transformateurs Statiques, Alternateurs Synchrones. By R. Langlois-Berthelot. Pp. 267; figs. 180; index. Eyrolles Editeur, Paris.

Phenolic Resins. By Robitschek and Lewin. Pp. 261; figs. 137; index. Published for *British Plastics* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 30s.

Radio Control for Models. By G. Honnest-Redlich. Pp. 128; figs. and index. "Harborough" Publication, The Aerodrome, Billington Road, Stanbridge, nr. Leighton Buzzard. Price 8s 6d.

Electric Fuses. By H. W. Baxter. Pp. 199; figs. 138; index. Edward Arnold & Co., 41, Maddox Street, London, W.1. Price 21s.

ELECTRICITY SUPPLY

Kent Power Station Site

Inquiry into Thornhill Extensions

RAMSGATE Housing and Town Planning Committee has recommended that no objection should be offered to the erection of a power station on a 100-acre site between Ramsgate and Sandwich. It was stated that the nearest point of the proposed site is a mile from Cliff's End, outside the borough, and three miles from the town centre. The report added that there was every reason to believe that the power station would provide employment for technicians in the district who were unable to find other work.

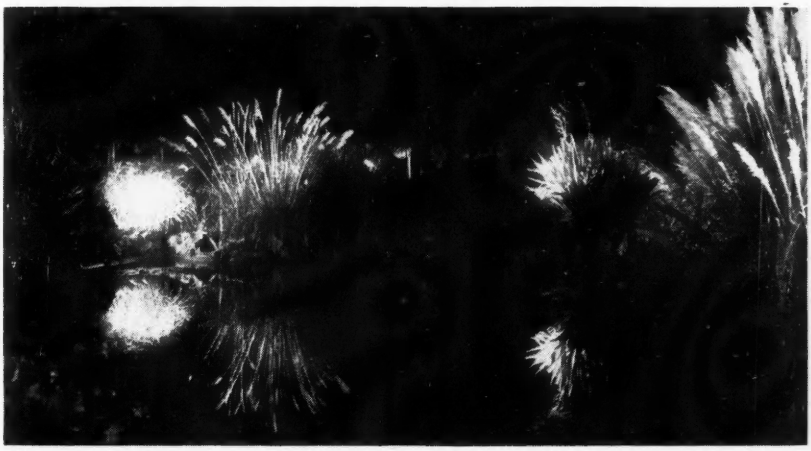
Thornhill Inquiry

At a Ministry of Fuel and Power inquiry at Dewsbury Town Hall on 17th October grounds of opposition to the proposed developments at Thornhill power station were stated to include fear of smoke emission and interference with the view of local residents. Among the objectors were three textile manufacturers, a number of other industrial and commercial concerns and 60 owners and tenants of houses in Ravensthorpe Road. Mr. H. Bliss, on behalf of the British Electricity Authority, stated that it was proposed to install a 40,000 kW turbo-alternator, and a boiler. No additional land would be required, nor was any new building involved except a reinforced concrete cooling tower, which might not be required. The new plant was to be placed in buildings already existing or in course of construction. As some of the old plant would be taken out, it was hoped that the effect would be beneficial to the amenities of the area because the new plant would be fitted with grit-arresting apparatus. He contended that any apprehension based on the performance of older cooling towers would not be realized in any new tower.

Torquay Illuminations

Floodlighting is used extensively in the illuminations at Torquay and such beauty spots as the Rock Walk and Abbey Park make an impressive night-time spectacle. The South Western Electricity Board (District manager, Mr. A. W. Allwood) was responsible for the scheme, installation details being planned by Mr. E. Ashton, installation and contracting superintendent. Much of the equipment used

The lily pond in Abbey Park, Torquay, with "Mazda" floodlighting in the shrubbery



was supplied by the British Thomson-Houston Co., Ltd., whose lighting engineers collaborated with Mr. Ashton. For the lily pond, shrubbery, and rockery in Abbey Park "Mazda" floodlights with 500 W tungsten lamps combine with others housing 400 W mercury vapour lamps; colour screens add to the brilliant overall effect. In the sunken gardens floodlights with 1,000 W line filament lamps and special diffusing louvres are used. A particularly impressive set-piece is a large floral replica of the Torquay coat of arms. More than 100 projectors make up the Rock Walk installation, with a preponderance of mercury vapour lamps which show up the green foliage to advantage.

Street Lighting

WALLINGFORD Council has chosen one of two street lighting schemes submitted by the Southern Electricity Board. It provides for mercury-vapour lighting in the principal streets and filament lamps elsewhere. The capital cost of the entire scheme will be £4,849 and removal of the gas lamps will cost £1,137.

The surveyor to BRIGG (LINCS) Urban District Council, in a report to t' e Council on the conversion of the town's street lighting from gas to electricity, estimates that it would save the ratepayers approximately £290 a year. The General Purposes Committee has recommended that the scheme should be carried out.

Conservators Withdraw Objection

An objection recently raised by the Ashdown Forest Conservators to the erection of overhead lines in the Nutley area by the South Eastern Electricity Board has proved to be due to a misunderstanding of the exact nature of the proposals. When representatives of the Conservators and of the Board met it was explained that the lines would be erected alongside the road and not over the forest. The Board was perfectly entitled to carry out such operations.

Power Plant Contracts

Referring to the note on page 572 of our issue of 13th October the Franki Compressed Pile Co., Ltd., points out that it was responsible for installing the considerable number of piles on which the main foundations of the Roosecote power station, Barrow-in-Furness, are carried.

Parliamentary News

By Our Special Reporter

IN the House of Commons last week Mr. Black, the Conservative member for Wimbledon, moved to annul the Electricity (Severance Compensation) Regulations, 1950. He said that local authorities had already been compelled to wait two and a half years after the vesting date to know the basis on which this fund was to be distributed among them. Two difficult consequences of the delay had been that local authorities had not been able to estimate the individual amounts they would have from the fund, and hence for the past three years had had to levy a needlessly high rate. Furthermore, the local authorities had lost interest for about two and a half years on this fund of £5,000,000. Taken at 3 per cent, by 31st December they would have lost no less than £426,000. On the other hand the Electricity (Pension Rights) Regulations of 1948, governing the transfer of the superannuation relative to electricity employees from the local authorities to the B.E.A., laid it down that the local authorities should pay interest at 3 per cent compound.

Mr. Erroll, who seconded the motion for the annulment, hoped that some explanation would be forthcoming for this delay. Sir Ian Fraser, Col. Clarke, Mr. Vane, and Mr. Molson all put the case for local authorities.

Mr. Robens, Parliamentary Secretary to the Ministry of Fuel and Power, said that the Act gave no power to the Minister to pay anything by way of interest. The House must have been aware at the time the Act was passed that there would be some time lag, and there was no indication then that the House wanted interest payment on top of the £5,000,000 which subsequently appeared in the Act. The compensation was not for the loss of the undertakings. It was to compensate local authorities for severance when in point of fact certain overhead charges would go on until they had reorganized either their office administration or in whatever direction the overhead charges lay for which they were getting no income. The discussions were begun three months before vesting day.

Mr. Brendan Bracken described the position as utterly unsatisfactory, and said they must have another opportunity of dealing with the matter.

Eventually, Mr. Black, in view of the fact that the matter would be raised again, withdrew his motion.

Hearing Aids

Mr. Bevan, the Minister of Health, said that experiments with the "Medresco" aid modified for use with a bone-conduction receiver were not yet complete and he could not say when they would be generally available under the National Health Service.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Britannia Electric Lamp Works, Ltd., reports a consolidated trading profit for the year ended 31st March of £79,953, as compared with £52,314 for the preceding year, and after providing for depreciation, £33,640 for taxation, and deducting other charges, there is a net profit of £29,165 (against £22,624). The dividend for the year is unchanged at 12½ per cent and £36,239 is carried forward (against £19,833 brought in).

Scophony-Baird, Ltd., reports a loss for the year to 31st March last of £54,547, as compared with a loss of £13,448 for the preceding year, which is increased to £80,100 by amounts written off development, patents, etc. To this is added debit brought in of £32,911, less provision for contingencies written back, £2,000, leaving a debit to be carried forward of £111,011.

The Radio & Television Trust, Ltd., reports a consolidated loss for the year to 31st March last of £27,010, as compared with a loss of £47,008 for 1948-49. The debit balance carried forward is raised by £554,337 to £823,014 after writing off £500,000 from the book values of investments in certain subsidiaries.

The British Electric Traction Co., Ltd., has declared an interim dividend of 7½ per cent, less tax, on the deferred ordinary and on the "A" deferred ordinary stock issued in December last as a 200 per cent capital bonus. The interim dividend for the previous year was 15 per cent, on the deferred stock only.

The East African Power & Lighting Co., Ltd., reports a group profit for 1949 of £267,908, as compared with £173,903 for 1948, after providing £123,699 for depreciation. The final ordinary dividend is 4 per cent on increased capital, making 7 per cent for the year (same), and an interim of 3 per cent (same) is paid on account of 1950.

The Sturtevant Engineering Co., Ltd., has declared an interim dividend of 5½ per cent, tax free, on capital increased by a 20 per cent bonus (against 5½ per cent on the old capital).

Ericsson Telephones, Ltd.—The directors propose a scrip bonus from capitalized profits of one 5s ordinary share for each eight ordinary shares held.

Crabtree Electrical Industries, Ltd., reports a group profit for the year ended 31st July last of £370,953, as compared with £349,346 for the preceding year, and a group profit, after deducting all charges, including taxation, of £135,956 (against £122,310). The final ordinary dividend is 12½ per cent, making 17½ per cent for the year (unchanged).

Ever Ready Co. (Gt. Britain), Ltd.—Interim dividend 15 per cent (same).

New Companies

Conduit Distributors, Ltd.—Registered 12th October. Capital £10,000. Electricians, mechanical engineers and manufacturers, workers and dealers in electrical apparatus and goods, etc. Subscribers : E. C. J. Whittingham and C. G. Pagett. Solicitors : Williams & Cole, Walsall.

Elliottronic, Ltd.—Registered 10th October. Capital £100. Manufacturers of and dealers in electronic articles of all kinds, etc. L. Bagrit (director of Elliott Brothers (London) Ltd., etc.), is the first director. Regd. office : Century Works, Conington Road, Lewisham, S.E.13.

Viking Lamps, Ltd.—Registered 11th October. Capital £1,500. Manufacturers of and dealers in neon and electric signs, fluorescent lamps and lighting equipment, etc. Directors : E. Bastow, G. Daniels, C. S. Conradi and Mrs. Olive Conradi. Regd. office : 952, Chester Road, Stretford, Manchester.

Regentone Radio & Television, Ltd.—Registered 11th October. Capital £10,000. Directors : W. Harris, Anne Harris and J. G. G. Noble. Regd. office : 3 Broad Street Buildings, Liverpool Street, E.C.2.

Vernon's Fuse Co., Ltd.—Registered 2nd October. Capital £2,000. Manufacturers and repairers of and dealers in electrical fuses, valves, time switches, control gear, etc. Directors : L. G. V. Russell and H. McKim. Regd. office : 72, High Street, Teddington, Mdx.

Murphy Mercantile, Ltd.—Registered 4th October. Capital £100. Dealers in domestic, commercial and industrial appliances, apparatus and equipment, radio, television and wireless receiving and transmitting apparatus, etc. Subscribers : C. J. Pollard and G. Conrad. Regd. office, 62, Brook Street, W.1.

Bankruptcies

L. Atelson, trading as Leonards, 336, Station Road, Harrow, Middx., radio and electrical fittings.—Receiving order dated 4th November, 1949, rescinded on 18th September, 1950, and petition filed 7th October, 1949, dismissed, the court exercising its discretion under section 108 of the Bankruptcy Act, 1914.

STOCKS and SHARES

STOCK Exchange business has been reasonably active during October. Prices, generally, have improved under the genial influence of a fair amount of buying, which, coming upon markets none too well supplied with floating stock, exercised a decided effect upon quotations and, at the same time, served to encourage the more cheerful feeling which has spread throughout the House during the past few weeks. Institutional buyers, such as the banks, insurance and trust companies, have been buyers of substantial amounts of stock. Companies that have followed the plan of placing large amounts of loan capital with outside institutions have not escaped criticism for adoption of this comparatively new development, though, from the practical point of view, it has made no difference to quotations of existing securities. Company reports on the whole make cheerful reading, and investment is content to accept what seem to be moderate rates of yield, provided that these are obtainable from front-rank issues.

S. Smith & Sons (England)

Opening of the Motor Show usually leads to a good deal of enquiry about the shares of component manufacturers. As mentioned here a fortnight ago, J. Lucas shares were already the centre of keen interest in anticipation of next month's due dividend. Having risen further to 33s 6d, the shares now show a yield of under 3½ per cent on the basis of last year's payment. A final dividend from S. Smith & Sons is due also about the middle of November. Last year the 1s deferred shares received 37½ per cent and the £1 preferred 17½ per cent. After their fixed 7 per cent dividend, the latter participate in profits equally with the deferred. On last year's rates, the deferred at 10s, and the preferred at 81s 3d, show respective yields of £3¾ and £4 6s 3d per cent.

Electric Batteries

Investments connected with the manufacture of electric batteries are also apt this month to come in for attention reflected from the Earls Court show. Among the leaders, the £1 shares of Chloride Electrical Storage, makers of the "Exide," "Drydex" and other batteries, are seldom in easy supply, but a limited number of the "A" issue is at present available at 58s 9d. On a 12½ per cent dividend basis, the yield works out at 4¼ per cent. Ever Ready 5s shares can be bought at just under 30s to pay £5 18s 9d per cent, and Oldham & Sons 1s ordinary are quoted at 5s 6d, the return in this case being nearly 5½ per cent, calculated on the annual rate of the 25 per cent dividend paid for the ten months ended last March.

Capital for British Oxygen

The British Oxygen Company is to make its long-awaited capital issue in two parts, the first a private placing of £4 million loan stock, and the second an offer of ordinary shares to existing holders at 70s per share, on the basis of one new share for every £5 stock held. The price of the existing units having reacted on the news to 90s, "rights" to the issue would at present be worth about 3s per share. Together, the issues will produce some £6·4 million, an amount larger than the present issued ordinary and preference capital of the company. For the greater proportion of it, the company follows the recent example of I.C.I. and Distillers in bypassing the Stock Exchange market, as opposed to the action of Lever Bros. and Imperial Tobacco in opening their issues to stockholders or the public. Allotment letters for the British Oxygen ordinary share issue are expected to be in stockholders' hands early next month.

Marryat & Scott Holdings

Dealings were due to begin this week in the newly-introduced shares of this company. Opening prices were expected to be around 21s for the 6 per cent preference, and 4s 9d for the 2s ordinary shares. Particulars advertised in advance showed the group's principal interests to include passenger and goods lifts, electrical switchgear and distribution equipment and electrical contracting. On the basis of estimated profits for this year, the preference dividend is covered ten times. Earnings for dividends and reserves would work out at 64·8 per cent on the £100,000 ordinary capital, and a dividend at the rate of 22½ per cent is indicated. At the anticipated market prices, the preference shares would give a return of £5 13s 3d per cent, and the ordinary nearly 9½ per cent at the dividend rate mentioned.

Prices Mainly Firm

Revo have hardened to 43s 3d, and other changes, small in most cases, are mostly in favour of shareholders. The Radio and Television Trust publishes a preliminary statement which shows that the deficit to profit and loss account is now no less than £823,000. The nominal price of the ordinary shares has receded to 6d. Shares in the "heavy" industry companies, e.g., Babcock & Wilcox and Vickers, are a firm market. The latter are 33s 9d, Babcocks 64s 6d. Telephone Properties have risen 2s 6d to 23s 9d. Hoover improved to 47s 9d, Electric & Musical to 22s 6d, Vactric to 9s 6d. Telegraph Constructions at 40s, and Telephone Manufacturing at 11s, are both a few pence higher on the week.

Railway Congress

Electric Traction Considerations

THE only electric traction topic discussed at the fifteenth International Railway Congress in Rome (25th September to 4th October) was the method most favoured for transmitting power from the driving motors to the axles of electric locomotives, motor coaches, and diesel-electric units of various types. Replies to questionnaires circulated to the principal railway administrations of the world have been collated and summarized. They enabled practice in a group of countries including Great Britain, the Commonwealth and the United States to be reviewed by Mr. W. S. Graff-Baker, chief mechanical engineer (railways), London Transport Executive.

The alternatives discussed were rigid or resilient gearing from axle-hung, nose-suspended motors or a flexible drive of the quill or similar type from motors suspended in the main or bogie frames independently of the axles. Replies received by Mr. Graff-Baker from London Transport, the Southern, Eastern and Midland Regions of British Railways, the Victorian Government Railways and the Pennsylvania Railroad unanimously favoured the axle-hung, nose-suspended motor for speeds up to 75 m.p.h. The Pennsylvania at present employs frame-mounted motors with flexible drives in the majority of its locomotives, but proposes in future to revert to axle-hung motors on grounds of simplicity and low capital cost. This decision is interesting in the light of the facts that the Pennsylvania is an a.c. system and that the pulsating torque of a.c. traction motors is one of the factors which are sometimes quoted as making a flexible drive necessary.

Flexible Drive for High Speeds

An important feature of the report is a statement by the Southern Region of British Railways that a flexible drive is desirable both in locomotives and motor coaches when speeds over 75 m.p.h. have to be run. So far the axle-hung motor has been universal in this Region, as on all other British electrified lines. Indeed, the only example of a flexible quill type drive now running in this country is the Brown, Boveri gas turbine locomotive in the Western Region.

It is also of interest that the London Transport Executive reports having a bogie with flexible drive under construction. This Executive makes the general observation that unsprung weight (as with an axle-hung motor) is considered to increase impact shock at rail joints and set up heavy oscillation of the bogie bolsters. Experience has shown that wear of track can be reduced by fitting one traction motor only in each bogie, as in the latest London Transport "R" class surface line stock, while at the same time riding is improved by cutting down the masses which cause lateral forces.

Systems in Other Countries

Replies to Mr. Graff-Baker from India, South Africa and New Zealand showed that India alone of these three makes extensive use of frame-mounted motors with flexible drives, and is not proposing to abandon them. New Zealand has a few examples of this type of transmission in service, but expects to employ axle-hung motors in future designs. The South African Railways favour axle-hung motors in conjunction with resilient gearwheels using rubber elements. Some trouble has been experienced on one or two railways with gearwheels of this type in which springs are used to impart resilience. All electric motor coaches operated by the administrations replying to Mr. Graff-Baker are powered by axle-hung motors, some of them having resilient gearing.

Other reporters whose conclusions were presented to the Congress dealt with the Continental countries where frame-mounted motors and flexible drives are more in evidence. In general, locomotive running departments express a preference for axle-hung motors on the ground of easy maintenance, while permanent way departments are in favour of motors that are fully spring-borne. It appears that flexible drives will be necessary at the high speeds now required of main-line electric traction, and the problem will be to evolve a generally acceptable type from the many varieties now in use.

NEXT WEEK'S EVENTS

Monday, 30th October

BRISTOL.—Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Supply Group. Chairman's address by C. Morley New, followed by an address by the chairman of the Supply Section, S. E. Goodall.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Discussion on "Projection-versus Direct-Viewing Television in the Home." Opened by W. T. Cocking.

READING.—Great Western Hotel, 7 p.m. I.E.E. District Meeting. "Wind Power," by T. G. N. Haldane.

Tuesday, 31st October

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. "Multi-Channel Measurement of Physical Effects by Confluent Pulse Technique, with particular reference to the Analysis of Strain," by J. G. Yates, D. H. Lucas and D. L. Johnston.

Grosvenor House, Park Lane, W.1, 6 p.m. Electrical Contractors' Association (London Branch). Annual dinner and ball.

At the Royal Society of Tropical Medicine and Hygiene, Mansion House, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "The Frequency Response Approach to Automatic Control Problems," by A. R. Aikman.

LOUGHBOROUGH.—The College, 6.30 p.m. I.E.E. East Midland Centre. "Fault-Throwing Tests on the 132 kV Grid System under Normal Working Conditions," by W. Casson and F. H. Birch.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Supply Group. "Some Experience with a British A.C. Network Analyser," by G. Lyon.

RUGBY.—E.M.E.B. Little Church Street, 6.30 p.m. I.E.E. Rugby Students' Section. "The Operation of large Synchronous Condensers," by D. D. Stephen.

YORK.—Royal Station Hotel, 7 p.m. I.E.E. North Midland Centre. "Railway Electrification in Great Britain," by C. M. Cock.

Wednesday, 1st November

BATH.—Electricity Showrooms, 6.30 p.m. I.E.E. Bristol Students' Section. Cardiff exchange paper.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. Problems night.

MIDDLESBROUGH.—Cleveland Technical Institute, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "Some notes on Electrical Installations in large Chemical Factories," by D. B. Hogg.

NEWCASTLE-ON-TYNE.—Minor Durrant Hall, Oxford Street, 6.15 p.m. I.E.S. Newcastle Centre. "The Problems Associated with Underground Lighting in British Coal Mines," by D. A. Strachan.

PORTSMOUTH.—British Electricity House, 111, High Street, 6.30 p.m. I.E.E. Southern Centre. Discussion on "Fluorescent Lighting."

SWANSEA.—4, Northampton Gardens, 5.45 p.m. I.E.S. Swansea Group. Film evening.

WOOD GREEN.—"Three Jolly Butchers" Hotel, N.22, 8.15 p.m. A.S.E.E. North London Branch. "High Frequency Heating in Industry," by K. A. Zandstra and A. J. Pinkney.

YORK.—Royal Station Hotel, 8 p.m. A.S.E.E. York Branch. "Variable Speed Motors," by C. V. Hill.

Thursday, 2nd November

BIRMINGHAM.—M.E.B., 21, Paradise Street. I.E.S. Birmingham Centre. Demonstration and display of new lighting equipment.

CAMBRIDGE.—University Arms Hotel, 7.30 p.m. I.E.E. East Midland Centre. District meeting. "The Economical Utilization of Electricity in Great Britain," by R. B. Giles.

CARDIFF.—S. Wales E.B., The Hayes, 5.45 p.m. I.E.S. Cardiff Centre. Film evening.

CROYDON.—Café Royal, North End, 8 p.m. A.S.E.E. South London Branch. "The Prevention of Electrical Accidents," by Col. Emerson.

DUNFERMLINE.—Unitas Hall, Queen Anne Street, 7 p.m. Dunfermline and District Electrical Society. "Stage Illusion," by Prof. M. G. Say.

EXETER.—Agricultural House, Queen Street, 7 p.m. I.E.S. Exeter Group. "Application of Fluorescent Lamps to Street Lighting," by N. W. Wood.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Report on "The Education and Training of Electrical Technicians," prepared by the Joint Committee on Practical Training in the Electrical Industry. To be presented by Sir Arthur P. M. Fleming, chairman of the Joint Committee.

At the Royal Society of Arts, John Adam Street, W.C.2. Institution of Engineering Inspection. "Inspection in Welding," by J. C. Cocks.

Friday, 3rd November

BATH.—S.W.E.B. Showrooms, 7 p.m. I.E.S. Bath and Bristol Centre. "Application of Fluorescent Lamps to Street Lighting," by N. W. Wood.

HUDDERSFIELD.—Electricity Showrooms, Market Street, 7.15 p.m. I.E.S. Huddersfield Group. "Colour," by W. J. Wellwood-Ferguson.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. "Modern Heat Treatment Furnaces," by L. G. A. Leonard.

Practical Electrician's Pocket Book

THE 1951 edition of "The Practical Electrician's Pocket Book" has been enlarged by a number of new chapters. The section dealing with electric motors has been extended by a chapter on "Testing a Motor," and other new chapters are "Varnishing Windings," "Electricity in Motor Vehicles," "Maintenance of Cookers," and "Rectifiers and Convertors." With the co-operation of the Area Electricity Boards the mains voltage tables, containing over 5,000 entries, have been fully revised. The pocket book (price 5s) is published by *Electrical & Radio Trading*, 186, High Holborn, London, W.C.1.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1945

4024. Marconi's Wireless Telegraph Co., Ltd.—Electric circuit arrangements for driving vibratory mechanical systems. 16th February, 1945. (646354.)

4620. Roberts, T. A., and Happerfield, G. J.—Electric heating appliances. 22nd February, 1946. (646561.)

9520. Marconi's Wireless Telegraph Co., Ltd.—Indicator and/or control system. 16th April, 1945. (646355.)

13303. Telephone Manufacturing Co., Ltd., and Harrison, K. W.—Electric carrier wave signalling systems employing thermionic valves. 1st May, 1945. (Cognate application, 21238, 20th August, 1945.) (646492).

18983. Marconi's Wireless Telegraph Co., Ltd.—Impedance-matching device for transmission lines. 24th July, 1945. (646360.)

22307. Marconi's Wireless Telegraph Co., Ltd.—Radio distance determining system. 29th August, 1945. (646361.)

23574. Marconi's Wireless Telegraph Co., Ltd.—Electron-discharge devices and associated cavity resonator circuits. 12th September, 1945. (646362.)

24297/8. Materiel Electrique, S. W.—Dynamos. 19th September, 1945. (646281/2.)

1946

2424. Marconi's Wireless Telegraph Co., Ltd.—Phase shifting arrangements. 24th January, 1946. (646364.)

6156. Telefonaktiebolaget L. M. Ericsson.—Devices for registering telephone numbers of lines in automatic telephone systems. 27th February, 1946. (646365.)

11866. General Electric Co., Ltd., and Espley, D. C.—Electrical circuits embodying a cathode-follower circuit. 3rd November, 1949. (646562.)

19384. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Dry-shaving apparatus. 28th June, 1946. (646368.)

20499. British Thomson-Houston Co., Ltd.—Electric-discharge lamps. 9th July, 1946. (646369.)

27870. Compagnie Générale d'Electricité.—Lattice electrical network. 17th September, 1946. (Cognate application 27871, 12th April, 1946.) (646564.)

30535. Compagnie Générale d'Electricité.—Telecommunication systems with alternative routing facilities. 14th October, 1946. (646374.)

34287. Tuttle & Kift, Inc.—Electric heater and method of making same. 19th November, 1946. (646426.)

34288. Tuttle & Kift, Inc.—Hinged electric heating unit. 19th November, 1946. (646427.)

36023. Wiig, R. K. A., and Laugaker, J. K.—Electrically operated automovable implements. 5th December, 1946. (Convention date not granted.) (646285.)

36061. British Thomson-Houston Co., Ltd., and Read, J. C.—Mercury arc rectifiers. 24th November, 1947. (646286.)

1947

2150. British Thomson-Houston Co., Ltd., and Mynall, D. J.—Electronic integrating circuits. 23rd July, 1948, (646568.)

3704. Standard Telephones & Cables, Ltd.—Arrangements for selecting electric pulses having given shape characteristics. 7th February, 1947. (646569.)

7379. Landis & Gyr Soc. Anon.—Manufacture of small commutators. 17th March, 1947. (646571.)

10232. Punch Engineering Pty., Ltd.—Carrier telephone transmission systems. 17th April, 1947. (Cognate application, 10233, 19th August, 1946.) (646500.)

10408. Standard Telephones & Cables, Ltd., and Outram, L. J.—Public address systems. 28th May, 1948. (646501.)

11141. Beka St. Aubin Akt.-Ges.—Electric hand switches for dictating devices. 25th April, 1947. (646381.)

13131. Compagnie Générale de Telegraphie sans Fil.—Electronic tubes with velocity modulation. 15th May, 1947. (646430.)

15436. Telefonaktiebolaget L. M. Ericsson.—Automatic telephone systems. 11th June, 1947. (646288.)

16345. Standard Telephones & Cables, Ltd.—Carrier current message transmission systems. 20th June, 1947. (646582.)

17880. British Thomson-Houston Co., Ltd., and Widnall, F.—Flameproof fittings for double-ended tubular electric lamps. 27th August, 1948. (Cognate application, 12248, 4th May, 1948.) (646431.)

20437. Bendix Aviation Corporation.—Electronic voltage regulator. 29th July, 1947. (646385.)

21089. Sylvania Electric Products, Inc.—Fluorescent material. 1st August, 1947. (646575.)

21687. Sylvania Electric Products, Inc.—Electric gaseous discharge device. 7th August, 1947. (646386.)

22596. Siemens, Bros. & Co., Ltd., and Humphries, H. E.—Automatic telephone systems. 16th August, 1948 (646439.)

22941. Goodman, A., and Gannon, W. F.—System for maintaining a substantially constant temperature in an area to be electrically heated. 7th August, 1948. (646576.)

23239. Landis & Gyr Soc. Anon.—Electric receivers for a remote controlled installation operating with synchronous selectors, and employing audio-frequency currents super-imposed on heavy current mains. 21st August, 1947. (646505.)

23516. Westinghouse Electric International Co.—Electrostatic precipitators. 26th August, 1947. (646577.)

23675. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Electron microscopes. 27th August, 1947. (645440.)

25612. Sangamo Weston, Ltd.—Electrical measuring instruments. 19th September, 1947. (646442.)

27445. Crompton Parkinson, Ltd., Powell Duffryn Research Laboratories, Ltd., and Bloomfield, C. J.—Manufacture of brushes for electrical machines. 5th October, 1948. (646579.)

27643. British Thomson-Houston Co., Ltd.—Amplifier circuits. 15th October, 1947. (646580.)

28294. Philips Electrical, Ltd.—Direct-current voltage amplifiers. 22nd October, 1947. (646581.)

31546. General Electric Co., Ltd., and Edwards, E. F.—Electric discharge lamps. 10th November, 1948. (646452.)

31624. Greene, T.—Electric measuring apparatus. 30th September, 1948. (646392.)

32198. Polytechnic Institute of Brooklyn.—Co-axial cables. 5th December, 1947. (645454.)

32243. Hudson, C. S., and Milnes, A. G.—Electromagnetic indicating or warning apparatus. 23rd December, 1948. (646585.)

32799. Cinema-Television, Ltd., and Freeman, G. S. P.—Cathode-ray tubes. 18th November, 1948. (646458.)

33138. General Electric Co., Ltd., and Hubbold, S.—Electric lighting fittings. 15th December, 1948. (646299.)

34187. Hulst, J. Van.—Electromagnetic hammer devices. 24th December, 1947. (646396.)

34851. Soc. Anon. Des Etablissements L. Hatot.—Small electromagnetic motors. 30th December, 1947. (646398.)

35104. Compagnie des Lampes.—Grids for electronic tubes. 31st December, 1947. (646461.)

1948

811. Muller, H.—Electric chokes, transformers or the like having a variable reluctance. 8th January, 1949. (646464.)

1676. Bull, C. S.—Electron-discharge devices. 24th October, 1945. (Divided out of 601966.) (646303.)

2076. Branson, J. C. S., and Branson, L. C.—Amplifying devices for use with telephone apparatus. 22nd February, 1949. (Cognate application, 4084, 15th February, 1949.) (646589.)

2768. Standard Telephones & Cables, Ltd., and Feldhusen, I. V.—Switching means for high-frequency circuits. 28th January, 1949. (646510.)

3195. British Telecommunications Research, Ltd., and Holloway, D. G.—Frequency-control of relaxation oscillators. 1st February, 1949. (646474.)

4242. Philips Electrical, Ltd.—Circuit arrangements in which high-frequency oscillations are generated or amplified. 13th February, 1948. (646475.)

4753. Guardian Electric Manufacturing Co.—Electromagnetically operated step-by-step selector switch. 18th February, 1948. (646401.)

4771. Metropolitan-Vickers Electrical Co., Ltd.—Electric-discharge devices. 18th February, 1948. (646402.)

4836. Guardian Electric Manufacturing Co.—Snap-action electric switch. 18th February, 1948. (646476.)

5305. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Electronic switching devices. 23rd February, 1948. (646512.)

5334. British Thomson-Houston Co., Ltd.—Clothes washing machines. 23rd February, 1948. (646403.)

5644. British Thomson-Houston Co., Ltd.—Circuits for electric-discharge devices. 25th February, 1948. (646515.)

6041. Guardian Electric Manufacturing Co.—Thermal time-delay electric relay. 27th February, 1948. (646518.)

6190. Siemens Bros. & Co., Ltd., and Long, D. P.—Telephone systems. 25th February, 1949. (646519.)

6218. Londex, Ltd., and Besson, A. P.—Area measuring apparatus. 26th February, 1949. (646520.)

6252. Birlec, Ltd.—Induction furnaces. 28th February, 1948. (646521.)

7130. Tesla, Electrical & Radio Industry, National Corporation, Hlubucek, V., and Merhaut, J.—Supervision of remote substations. 8th March, 1948. (646592.)

8309. Barrett, J.—Electromagnet system suitable for reciprocating electric motors. 20th March, 1948. (646527.)

8822. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Laminated magnetic structures. 25th March, 1948. (646528.)

8874. Compagnie Générale de Telegraphie sans Fil.—Wave-guide arrangements. 25th March, 1948. (646309.)

9308. Standard Telephones & Cables, Ltd.—Coaxial amplifiers. 2nd April, 1948. (646529.)

9459. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Television transmitting tubes and circuits for use therewith. 5th April, 1948. (646595.)

9988. Metropolitan-Vickers Electrical Co., Ltd., and Hardie, A. M.—Apparatus for checking time bases. 21st January, 1949. (646531.)

10149. Geyer, F.—Electric transformers. 12th April, 1948. (Cognate application, 10150, 23rd June, 1947.) (646598.)

10366. British Thomson-Houston Co., Ltd.—Ultra-violet radiation emitting phosphors. 14th April, 1948. (646533.)

10504. British Thomson-Houston Co., Ltd.—Fluorescent or phosphorescent compositions. 15th April, 1948. (646535.)

11972. Lockers (Engineers), Ltd., Locker, J. R., and Whitelock, J. H.—Electromagnetic vibrators. 29th November, 1948. (646605.)

11994. Smith, F. S. D. (Dumore Co.).—Brush-supporting construction for electric motors or the like. 1st May, 1948. (646538.)

12049. Concordia Electric Safety Lamp Co., Ltd., Fennell, C. H., and Lucas, H.—Electric lamps. 3rd May, 1949. (646606.)

13448. Accumulatoren Fabriek Varta, N. V.—Process for the manufacture of accumulator plates sintered from metal powder. 18th May, 1948. (646313.)

13846. Compagnie Générale de Telegraphie sans Fil.—Guides for ultra-short waves, more particularly applicable to transmission through a rotating joint. 21st May, 1948. (646541.)

14326. General Electric Co., Ltd., Humphreys, B. L., and Kite, L. V.—Electromagnetic waveguides. 18th May, 1949. (646545.)

14327. M-O Valve Co., Ltd., Humphreys, B. L., and Kite, L. V.—Electric discharge devices. 18th May, 1949. (646546.)

15148. Standard Telephones & Cables, Ltd.—Noise reduction circuit for radio receivers. 4th June, 1948. (646547.)

15958. British Thomson-Houston Co., Ltd.—Bases for electric lamp devices. 14th June, 1948. (646553.)

16800. Pye, Ltd., and Dalgleish, J. W.—Electric wiring and coil forming. 21st June, 1949. (646314.)

16863. Reyrolle & Co., Ltd., A., Allan, A., and Amer, D. F.—Electric circuit-breakers of the gas-blast types. 3rd June, 1949. (646315.)

18355. Marelli & C. Soc. Per Azioni, E.—Electric fans, ventilators or the like. 8th July, 1948. (646317.)

20550. Ashdowns, Ltd., and Clayton, J. C.—Electric lampholders adapted for attachment to a wall or ceiling. 4th August, 1949. (646320.)

20945. British Thomson-Houston Co., Ltd.—Dielectric compositions. 9th August, 1948. (646410.)

23280. Nijland, H. A. H.—High-voltage switches. 3rd September, 1948. (646619.)

24197. Egyesult Izzolampa es Villamossagi Reszvenytarsasag.—Fluorescent luminous bodies. 15th September, 1948. (646414.)

24389. Barrett, J.—Electrical motors and generators. 17th September, 1948. (646621.)

24623. Sangamo Weston, Ltd., and Lovegrove, H. J.—Arrangements for effecting a measuring, indicating or control operation by an electric current. 20th October, 1949. (646622.)

25172. Materiel Electrique S.W.—Rapid-response direct-current exciter generators. 19th September, 1945. (Divided out of 646281.) (646346.)

25305. Landis & Gyr., Soc. Anon.—Inductive transducer for electrical transmission of mechanical magnitudes. 28th September, 1948. (646415.)

25887. Wilcox & Co., Ltd., E., and Wilcox, E.—Electric fuse-links. 16th September, 1949. (646628.)

26313. Newton Victor, Ltd., and Cordingly, N. C.—X-ray tubes. 16th September, 1949. (646418.)

27485. Pirelli-General Cable Works, Ltd., and Arman, A. N.—Oil-filled electric cables. 22nd August, 1949. (646327.)

27496. Lucas, N. H., Lucas, E., and Holder, H. T.—Electrically heated smoothing iron. 22nd October, 1948. (646328.)

27532. British Thomson-Houston Co., Ltd.—Manufacture of high-voltage capacitors. 22nd October, 1948. (646330.)

27652. Stastik, G.—Aero power station for generating electric energy or motive force generally, driven by fluid current wind. 25th October, 1948. (646339.)

27683. Thorneycroft & Co., Ltd., J. I., and Clarke, F. M.—Switches for electrical-circuits. 29th August, 1949. (646342.)

1949

20839. Materiel Electrique S.W.—Direct-current exciter generators. 19th September, 1945. (Divided out of 646281.) (646350.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Aireborough.—13th December. U.D.C. Fluorescent street lighting installation. (See 20th October issue.)

Altrincham.—3rd November. Corporation. Street lighting installation. (See 20th October issue.)

Andover.—6th November. Borough Council. Automatic electric pumping plant for waterworks development scheme. Borough surveyor, Beech Hurst, Weyhill Road.

Australia.—New South Wales.—24th January. Department of Railways. Complete 1,500 V overhead conductor equipment for Parramatta-Lithgow electrification. (See 20th October issue.)

Bedfordshire.—24th November. County Education Committee. Electrical installation, etc., in new school at Leighton Buzzard. (See 20th October issue.)

Bedworth.—11th November. U.D.C. Street lighting equipment. (See this issue.)

Belfast.—24th November. Electricity Department. Fire fighting equipment. (See 20th October issue.)

Breconshire.—County Council. Electrical installation at Ynyscedwyn secondary modern school. (See 20th October issue.)

Bromsgrove.—28th October. U.D.C. Electric wiring for 130 houses on Charford estate and in Old People's Assembly Room, Crown Close. Surveyor, Council House.

Egypt.—2nd December. Director General, Electricity and Gas Administration. Supply of 167 km of underground cable. (See 20th October issue.)

Gillingham.—7th November. Corporation. Electrical installation in infants' school, Featherby Road. (See 20th October issue.)

Heston and Isleworth.—6th November. Street lighting installation. (See 20th October issue.)

India.—27th November. Directorate General of Industries and Supplies, New Delhi. House service meters. (C.R.E. (I.B.) 67454/50. Ten/1753.)*

Mysore.—27th November. Government Stores Purchase Committee, Bangalore. Supply of energy meters. (C.R.E. (I.B.) 67268/50. Ten/1750.)* 13th November. Lightning arrestors. (C.R.E. (I.B.) 67268/50. Ten/1751.)*

Newcastle-on-Tyne.—2nd December. City Education Committee. Electrical installation at Ravenswood Road county primary school. (See 20th October issue.)

New Zealand.—13th March, 1951. State Hydro-Electric Department. Auxiliary generator sets for Roxburgh power station. (C.R.E. (I.B.) 67647/50. Ten/1757.)*

South Africa.—21st November. Cape Town City Electricity Department. Supply of 5,000 30 A porcelain weatherproof pole fuse units. (C.R.E. (I.B.) 67387/50. Ten/1758./*

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

ORDERS PLACED

Grimsby.—Corporation. Electrical installations in houses at Nunsthorpe.—Hobson & Scott, Ltd. (£5,196 for 174 houses) and T. Dickinson & Son (£2,563 for 92 houses).

Guildford.—Housing Committee. Electrical installations in 142 houses.—Appleby & Co.

Newcastle-on-Tyne.—Regional Hospital Board. Electricity supply mains at the West Hartlepool General Hospital (£936).—F. Reid, Ferens & Co., Ltd.

Nuneaton.—Corporation. Lamp columns and fittings for fluorescent lighting in and near the Town Centre.—General Electric Co., Ltd.

Seaton Valley.—U.D.C. Electrical installation in 62 houses on the Village Road Estate, Cramlington.—A. S. Jameson.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick.—Houses for U.D.C. at Howling Lane (£28,600); J. Sample, builder, Warkworth.

Bangor.—Women's hostel for University authorities; Sir Percy Thomas & Son, architects, Cathedral Road, Cardiff.

Barnsley.—Houses (46), New Lodge Farm estate; borough surveyor, Town Hall.

Barry.—County primary school, Colcot; L. R. Gower, county architect, Glamorgan County Hall, Cardiff.

Belper.—Houses (30), Bullings Lane, Crich, for R.D.C.; Vic Hallam, Ltd., Valley Works, Langley Mill.

Blackpool.—Flats (40), Grange Park estate; borough surveyor.

Bolton.—Houses and flats (90), Johnson Fold estate; housing director, Town Hall.

Braintree.—Additions to fire station, Swan Side, including three-storey addition for offices, etc., boiler house and out-buildings; county architect, Chelmsford.

Brierley Hill (Staffs).—Office accommodation (£70,500) for U.D.C.; R. H. J. Comber, surveyor, Hawbush House, Brettell Lane.

Bristol.—New works, Marlborough Street; Henry Matthews & Co., Ltd., Lewinsmead.

Bromsgrove.—Sawmill, Stoke Prior Works; L. G. Harris & Co. Ltd., brush manufacturers.

Chester.—Conversion of "F" block at City Hospital into pediatric department (£12,552); J. A. Collin, Ltd., 355, Chester Road, Little Sutton.

Coventry.—Three-storey block of Council offices on site south of Earl Street; city architect, 1a, Warwick Row.

Dudley.—Houses (165), Sledmere estate No. 1.; Webb and Gray, architects, Tixall House, St. James's Road.

East Retford.—Houses (44), for T.C.; Vallance and Westwick, architects, White Hart Chambers, Mansfield.

Folkestone.—Flats (40), Bridge Street area; borough engineer.

Hereford.—Nurses' home at County Hospital for Birmingham Regional Hospital Board (£65,000); D. A. Goldfinch, architect to Board, 10, Augustus Road, Birmingham.

Leamington Spa.—Houses (108), Stud Farm estate; director of housing.

Llanelly.—Infants' school, Llwynhendy, for Carmarthenshire E.C.; county architect, Carmarthen.

London.—Offices (£100,000), London Bridge Street, S.E.; King Edward's Hospital Fund for London, 10, Old Jewry, E.C.2.

BRIXTON.—Flats (146), Loughborough Road, S.W.9., for the Guinness Trust; E. Armstrong, architect, 19, Manchester Square, W.1.

FINSBURY.—Re-erection of premises, 129-139, Finsbury Pavement, for Well Hall Properties, Ltd.; E. M. Joseph, architect, 10, Lowndes Square, S.W.I.

LEWISHAM.—Flats (108), Paragon Place; borough surveyor, Town Hall, Catford, S.E.6.

KENTISH TOWN.—Hostel for aged persons, Bartholomew Road; Thomas Sibthorp, architect, 27, Grosvenor Place, S.W.1.

Luton.—College of further education; Norman & Dawbarn, architects, 5, Gower Street, W.C.I.

Menai Bridge.—Houses (30), for U.D.C.; T. Alwyn Lloyd & Gordon, architects, 6, Cathedral Road, Cardiff.

Motherwell.—Omnibus garage and workshops; W. Basil Scott, architect, 19, Waterloo Street, Glasgow.

Newcastle-on-Tyne.—Primary school, Benton Park (£91,621); G. Bainbridge, builder, 205, Westgate Road.

North Riding.—Girls' grammar and commercial school, Redcar; J. Leathart, architect, Mount Lodge, Sunningdale, Berkshire.

Oldbury.—College of further education; S. T. Walker, architect, 83, Suffolk Street, Birmingham.

Oxford.—Extensions to factory for Thomas Evans, Ltd., Botley Road; Cripps and Stewart, architects, 123, London Road, Headington.

Conversion of Majestic Cinema, Botley Road, to factory; Frank Cooper, Ltd., Victoria Works, Park End Street.

Pembury.—Flats (24) for Hatton Housing Trust, Ltd.; W. N. Miller, architect, 48, Pembury Road, Tonbridge.

Penrith.—Houses (44), Scaws estate; U.D.C. surveyor.

Peterborough.—Factory extensions, Lincoln Road, Werrington; Plasticast Developments, Ltd., Clifton Avenue.

Peterlee (Co. Durham).—Houses (82) for Peterlee Development Corporation; G. M. Pearson & Sons, Ltd., builders, Hetton, Co. Durham.

Plymouth.—Children's home, Whitleigh estate; city architect.

Porthcawl.—Houses (104), Wilderness site; U.D.C. surveyor.

Prestwich (Lancs).—Houses (116), Carr Clough; borough surveyor, Town Hall.

Richmond (Surrey).—Flats (36), Woodville Road site, Ham; borough engineer.

Rochdale.—Adaptations at Healey Church School (£17,750); borough surveyor.

Saltcoats (Ayrshire).—21st October. Town Council. Electrical installations in 50 houses. R. Rennie, architect, 33 Vernon Street.

South Shields.—Hospital development scheme (£50,000) for South Shields Hospitals Management Committee, Ingham Infirmary, South Shields.

Stafford.—Pathological laboratory, ward, and other works, at the General Hospital (£68,153) for Birmingham Regional Hospital Board; W. J. Simms, Sons and Cooke, Ltd., contractors, Haydn Road, Sherwood, Nottingham.

Stockport.—Adaptations and alterations at Stockport College premises, Hempshaw Lane (£19,684); Daniel Eadie & Co., Ltd., Stockport.

Stourbridge.—Houses (74), Wollescote site; borough surveyor.

Tunstall.—Two blocks of shops and flats, Mill Hill Farm estate; W. A. Bott, borough surveyor, Town Hall, Stoke-on-Trent.

Tynemouth.—Factory and offices for Albert Edward Dock Sawmills, Ltd.; J. W. Taylor and Son, architects, St. James' Buildings, Gallowgate, Newcastle-on-Tyne.

Block of flats, Kennersdene Farm estate; Seal and Partners, architects, Westover Road, Bournemouth.

Upholland.—Grammar school (£178,326); G. & J. Seddon, Ltd., Little Hulton, nr. Bolton.

Walsall.—Factory premises; G. C. Wieland & Sons, 77, Blue Lane West.

Warrington.—Factory, Haydock Street; J. T. Clarke & Son, Thynne Street.

West Hartlepool.—New Rossmere and Brierton county secondary schools; R. H. Duns, quantity surveyor, Lambton Road, Jesmond, Newcastle-on-Tyne.

Houses (42), Southbrooke Avenue and Westbrooke Avenue; C. M. Yuill, Ltd., builders, Villiers Street, West Hartlepool.

Conversion of "Dinsdale Lodge" into hostel for old people (£15,747); borough architect, Municipal Buildings.

Widnes.—Dwellings (118), Crow Wood estate; borough architect.

I.H.V.E. EXAMINATIONS

THE associate membership examination of the Institution of Heating and Ventilating Engineers (Sections A and B) will take place during the week commencing 23rd April, 1951. There will not be a separate examination for graduateship. The examination will be held in London, but consideration will be given to arranging provincial centres if there are sufficient candidates from any particular area. Candidates desirous of entering for the 1951 examinations should submit their proposal forms not later than 31st December, next.